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A Study of The Impact of A District Computer Technology Program On Adoption Of Educational Technology

By

Catherine Suen ©

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Master of Education

In

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled A Study of the Impact of a District Computer Technology Program on Adoption of Educational Technology submitted by Catherine Suen in partial fulfillment of the requirements for the degree of Master of Education in Instructional Technology.

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Abstract

The purpose of this research was to assess the impact of a school district technology initiative on the adoption of computer technology as an innovation for teaching and learning. A review of the literature suggests that instructional technology is not widely implemented in the educational setting.

The Board of Trustees of a large school board in Western Canada operated a district Technology Incentive Program (TIP) from 1996 to 1999. This research project assessed the impact of the first year of TIP on 230 teachers. The data for this study were collected through quantitative and qualitative methodologies. The results showed that there was an increase in TIP participants' perception of the level of expertise in using a computer and usage of computers for teaching and non-teaching purposes. Results were discussed in terms of theories of change and innovation. Recommendations for future research were included.

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CHAPTER I

OVERVIEW OF THE STUDY

With the advance of computer technology, educators are feeling pressure to use computers in the classrooms. For example, some parents are demanding changes in the curriculum. They want computer technology to be integrated into the curriculum so that their children will be ready to meet the challenges of an information society once they graduate. Means and Olson, (1994), Schwarz (1996), and the U.S. Congress, (1995) have shown that, although computers are generally available in schools, a substantial number of teachers are either not using computers as tools for teaching, or the use of computers is at low level (e.g., word processing). Some school districts are looking for ways to support teachers so they will adopt computer technology into the instructional process.

In Western Canada, one large school district initiated a multi-year Technology Incentive Program (TIP) during the school year 1996-1997. The Board of Trustees approved a three year district project which provided teachers with computers and in-service training to encourage them to adopt computer technology in teaching.

Purpose of the Research

The purpose of this research project was to: (a) examine the effects of the TIP on selected aspects of the implementation of computer technology by teachers, and (b) make recommendations to school districts to encourage teachers in adopting computer technology.

Research Question

This study was designed to address the question: What impact did the first year TIP have on teachers with regard to computer usage? The research question was broken down into ten sub-questions (for both the TIP and non-TIP groups) so that the impact of the first year of the TIP could be examined in detail. Hypotheses were made for the first three sub-questions (for both the TIP and non-TIP groups) in order to determine the significance of data collected for those sub-questions.

Sub-questions

The sub-questions which addressed the issue of ***changes in skill and knowledge in computer usage*** were:

1.1 What was the impact of the Technology Incentive Program on participants' perception of their level of knowledge and skill in computer usage before and after they completed the TIP?

1.2 What changes were shown by non-TIP teachers, (teachers who applied but were rejected by the TIP) between the period of July, 1996 to March, 1998 with regard to their perception of the level of knowledge and skill in computer usage?

The sub-questions which addressed the issue of ***usage of computers for teaching*** were:

2.1 In using computers for teaching purposes, what was the impact of the TIP on the participants with regard to the number of hours of computer usage?

2.2 In using computers for teaching purposes, what changes were shown by non-TIP Teachers between the period of July, 1996 to March, 1998 with regard to the number of hours of computer usage?

The sub-questions which addressed the issue of ***usage of computers for non-teaching purposes*** were:

3.1 In using computers for purposes other than teaching, what was the impact of the TIP with regard to the number of hours of computer usage?

3.2 In using computers for purposes other than teaching, what changes were shown by non-TIP teachers between the period of July, 1996 to March, 1998 with regard to the number of hours of computer usage?

Hypotheses for TIP participants. Research hypotheses for sub-questions 1.1, 2.1 and 3.1 (for the TIP group) are as follows. It was hypothesized that teachers of the TIP would exhibit a difference, when comparing the periods before and after the TIP, with regard to (a) their perception of their skill and knowledge in using a computer, (b) the number of hours of computer usage for teaching purposes, and (c) the number of hours of computer usage for purposes other than teaching.

Research hypotheses for non-TIP group. Research hypotheses for sub-questions 1.2, 2.2, and 3.2 (for the non-TIP group) are as follows. It was hypothesized that Non-TIP teachers would exhibit a difference, when comparing the period before July, 1996 to the time of the research project in March, 1998, with regard to (a) their perceptions in the level of knowledge and skill in using a computer, (b) the number of hours they used the computer for teaching purposes, and (c) the number of hours they used the computer for purposes other than teaching.

The sub-question which addressed the issue of the ***impact of having a computer for one year*** was:

4. What was the impact of having a computer for one year on the TIP participants?

The sub-questions which addressed the issue of ***teachers' attitude towards computers*** were:

5.1 What was the impact of the TIP on the participants, with regard to their attitudes towards the use of computers?

5.2 What changes were shown by non-TIP teachers, between the period of July, 1996 to March, 1998 with regard to their attitudes toward the use of computers?

The sub-question which addressed the issue of the ***TIP participants' purchase of computer as result of the TIP*** was:

6. What was the percentage of teachers who perceived the TIP to be the major influence for their purchase of a computer after they took the TIP training?

The sub-questions which addressed the issue of the ***TIP training program*** were:

7.1 What was the impact of the TIP on the participants, in the usage of the Internet, multimedia software, word processing, and integration of computer with content area?

7.2 What changes were shown by non-TIP teachers, between the period of July 1996 to March, 1998 in the usage of the Internet, multimedia software, word processing, and integration of computer with content area?

7.3 What was the impact of the TIP on the participants, in the use of transferring data between applications, spreadsheet, and data base?

7.4 What changes were shown by non-TIP teachers between the period of July 1996 to March, 1998 in the use of transferring data between applications, spreadsheet, and data base?

The sub-questions which addressed the issue of ***interest shown in computer-related activities*** are:

8.1 What was the impact of the Technology Incentive Program on the participants in interest shown in computer-related activities?

8.2 What interests were shown by non-TIP teachers between the period of July, 1996 to March, 1998 in computer-related activities?

The sub-questions which addressed the issue of ***other factors which influence the use of computers*** are:

9.1 What were some factors, other than the TIP, which influenced TIP teachers' usage of computers?

9.2 What were some factors which influenced non-TIP teachers' usage of computers between the period of July, 1996 to March, 1998?

The sub-questions which addressed the issue of ***computer usage and teachers' perception of what they need*** are:

10.1 What were the perceived needs of the TIP participants in order to increase computer usage with students?

10.2 What were the perceived needs of the non-TIP teachers in order to increase computer usage with students?

Limitations

There were three limiting factors in this study. The first limitation of this study was that it was done about one year after the first TIP had been implemented. The perceived use of computers, and the perceived needs and attitudes identified by the teachers, may be confounding factors in that teachers may have had exaggerated or erroneous recollections of their perceptions because of the one year time-lapse between the initiation of the TIP and this study.

The second limiting factor may be that, since the author of this study was a participant of the Technology Incentive Program, the author's personal biases might have been unintentionally projected in the study. To overcome this limitation, both quantitative and qualitative data were used in this research to achieve a more balanced perspective.

The third limitation is the sample size of the non-TIP teachers. Although 64% of the TIP participants responded to the survey, the response rate of the non-TIP group was only 14%. Of the 371 teachers nominated by their schools, 230 teachers were accepted into the program and 141 teachers were rejected; no records were kept about the unsuccessful candidates of the TIP.

Delimitations

This research is a study of the teachers who participated in the TIP which was initiated by a large school board in Western Canada during 1996-1997. Although the TIP is to be continued for the years 1997-1999 for different groups of teachers, these subsequent TIP programs were not included in this study. This study explores the impact of TIP on a group of teachers who reported themselves to be novice-users of computer technology who sought training on a computer platform which was new to them. This was not a study of teachers who were experienced users of computers.

Definition of Terms

Technology Incentive Program

The first Technology Incentive Program is defined as the program, initiated by a school district in Western Canada during the school year 1996-1997, for teachers who were novice users of computer technology, to gain experience in using computers.

Impact of the Program

The impact of the program is defined by (a) the change of perception of teachers in the skill and knowledge or level of their expertise with computer usage, (b) the change in the number of hours computers were used for teaching purposes, (c) the change in the number of hours computers were used for non-teaching purposes, and (d) the attitude towards the use of computers shown by teachers.

Use of Computers

Use of computers is defined as the number of hours teachers used computers both at work and at home, before and after they participated in the program.

Usage of Computer for Teaching Purposes

Computer usage for teaching purposes is defined as using computers for everything related to teaching, e.g., classroom use of computers with students, use of computers for lesson planning, report cards, professional development and use of the Internet, software, and word processing related to the instructional process.

Usage of Computer for Non-Teaching Purposes

Non-Teaching purposes is defined as the usage of computer for purposes other than teaching, for example, searches on the Internet for personal reasons.

Non-TIP Teachers

Non-TIP teachers are teachers who volunteered but were not selected for the first year of the TIP which took place from July, 1996 to June, 1997. Due to limited funding, not all teachers who volunteered for the first TIP were selected.

Desk Top Publishing

Desk top publishing is defined in this study as the production of text documents with graphics.

Transferring Data Between Applications

Transferring data between applications refers to the transfer of data from one computer application program to another. For example, the transfer of data between PowerPoint/graphics to word processing.

Multimedia

In this study, multimedia refers to CD ROM, audio CD, clip art, graphics, and desk top publishing.

Word Processing

Word processing refers to application software products that allow a user to enter, modify, rearrange, format, display, save and print text in the computer (McDaniel, 1994).

Internet

Internet refers to the global networks of computers connected together using electronic signals and browsers to communicate between computers. According to McDaniel (1994), Internet is "... a collection of packet-switching networks that are physically interconnected by Internet Protocol (IP) gateways. These networks use protocols that allow them to function as a large, composite network" (p. 354).

Spreadsheet

A spreadsheet is a "... personal computer application software that allows a user to define mathematical or other logical relationships between columns and rows of cells and to determine the effect of a change in the value of one cell on the values in other cells" (George McDaniel, 1994, p.641).

Database

A database is an information system in which information and data are systematically categorized and generally utilized by computer users for retrieving and searching purposes.

Divisions One, Two, Three and Four

Division One in this study refers to grades one to three, Division Two refers to grades four to six, Division Three refers to grade seven to nine, and Division Four refers to grades ten to twelve.

CHAPTER II

LITERATURE REVIEW

This review of the literature will first demonstrate that computer technology is not being used extensively in classrooms for teaching and learning. Secondly, it will examine computer technology in the context of innovation-adoption theories. Lastly, it will show that the implementation of computer technology is affected by many factors which have been described in several theories of change.

Educational Use of Computers

With the introduction of microcomputers in schools during the early 1980s, expectations of computer usage for instructional purposes had steadily increased. Dwyer (1994) reported that the availability of technologies in the past few years in the form of convenient-sized devices, laptops, virtual reality headsets and computers with voice-recognition features had changed the way we work, learn and recreate. However, Means and Olson (1994) suggested that in the last two decades, technologies were used mainly for work, entertainment and communication and were not used extensively for educational purposes.

Use of Computer Technology in Alberta Schools

Schwarz (1996) surveyed 3,000 teachers in Alberta and found that, out of the 715 surveys which were returned, more than one quarter of all teachers did not use computers. In addition, more than three-quarters of all teachers who responded indicated that they used computers less than two hours per week.

Computer Technology in Classrooms in the States

According to a study done by the Office of Technology Assessment of the U. S. Congress (1995), schools in the United States had an estimated 5.8 million computers or about one computer for every nine students. This study also reported that, although computers were available in schools, a substantial number of teachers in the United States were not using computers for delivering instruction. The survey pointed out that more research is needed to investigate whether using technologies would change teaching and learning.

Barriers to the Use of Computers

In examining the barriers to the use of computer technology in Alberta schools, Schwarz (1996) asked what it would take to encourage teachers to use instructional computing technology with students. She reported that the needs of teachers with regard to organizational, resource and training issues must be met. At the school level, Schwarz suggested that a "supportive team environment" (p. 172) needs to be created to provide teachers with opportunities to get the help they need in incorporating computers into the curriculum. Schwarz recommended that teachers should be provided with access to up-to-date computers, easier scheduling of facilities, and access to timely technical and on-site help. The support of the administration is needed to provide network administrators, access to class sets of software, and time for continuous training in the use of computers. Schwarz stated that "in addition to clear vision and leadership, all the players in the educational community. . . must play an active role in promoting technology use in Alberta schools" (p. 170).

Innovation: An Embedding Problem.

Szabo and Anderson (1997), referring to the problem of Alternative Delivery Systems in university education, examined the reasons why instructional technology is not being used widely by university staff. They proposed that one of the factors causing instructional technology to be neglected is the "failure to recognize the problem we are dealing with is embedding INNOVATION" (p.2). They used this factor to help understand why a substantial numbers of teacher are not using computer technology as a teaching and learning tool. If we could develop a better understanding of the innovative nature of computer technology by examining the theories of innovation, it may help us understand why it is not being adopted widely in the classrooms. Szabo (1996) concluded that the innovation of instructional technology will not amount to anything until (a) a vision is developed, (b) training and infrastructure are provided and (c) teachers are empowered to develop that vision. As a result, a Training, Infrastructure and Empowerment System (TIES) was created and developed in 1997 and piloting began in 1998 to implement the innovation of instructional technology.

Innovation Diffusion Theories and Instructional Technology

Surry (1997) defined diffusion of innovation as the "process by which an innovation is adopted and gains acceptance by members of a certain community" (p.1). His orientation agrees with Szabo (1996) in that the study of innovation diffusion would be beneficial for the understanding of instructional technology. Generally, there are two main philosophical strands in instructional technology: the instrumentalist philosophy and the determinist philosophy. Instrumentalists believe that technology is a tool, which can be used either positively or negatively. Instrumentalists view the user as the one who will bring about change. Determinist philosophy subscribes to the theory that the superiority of technology is a force that will forge forward by itself and that technological superiority is the only necessary element for innovation to be adopted. The instrumentalists disagree with the claim that technological superiority alone will bring about the adoption of innovations. Referring to the instrumentalist and determinist philosophies, Surry (1997) concluded that adoption of innovations comes about gradually and that the users of technology will show us how innovations would be adopted by society.

Rogers (1995) defined innovation as "... an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (p.11). He also explained that diffusion of innovation is the process by which new ideas and changes are communicated in a social system over time. The spread or diffusion of new ideas can be both planned and spontaneous. In order for an innovation to be adopted, adopters of an innovation must know what the innovations are, be persuaded that the innovation is worth adopting, make the decision to adopt the innovation, implement the innovation, and make confirmation decisions to either adopt or reject the innovation. Some individuals are prone to adopt innovations earlier than others. These individuals are known as early adopters. Adoption of innovations by others is a gradual process. The rate of adoption of innovations is affected by how individuals view the innovations, namely:

1. Innovations will be adopted faster if the user perceives an innovation to be better than existing methods or practices.

2. Innovations will be adopted faster if the user perceives an innovation to be compatible with "deeply imbedded cultural values" and with "previously adopted ideas" (Rogers, 1995, p. 225). Rogers claimed that "previous practice provides a familiar standard against which an innovation can be interpreted, thus, decreasing uncertainty" (pp. 225-226).

3. The rate of adoption of an innovation is affected by the degree to which an innovation can be tried. New ideas that can be tried are usually adopted faster.

4. Adoption rate is affected by how the results of new ideas can be visibly and easily observed and described to others.

5. Adoption rate is affected by how an innovation is perceived to be easy or difficult to understand and to be implemented.

Implementation of Innovations and Theories of Change

A survey of the literature shows that implementation of innovations is closely linked to the theories of change (Firestone & Corbett, 1988; Fullan, 1991, 1992; Laney, 1984; Willis, 1993). According to Willis, "Michael Fullan's (1991, 1993) work on educational change is some of the most comprehensive and useful for those involved in encouraging and facilitating change" (p.31). According to Fullan (1992), the implementation of computer technology for classroom use is dependent on many factors. Fullan listed two main reasons for focusing on the implementation perspective; "the first is that we do not know what has changed (if anything) unless we attempt to conceptualize and measure it directly" (p. 21). Secondly, it is essential to examine implementation in order to understand ". . . why so many education innovations and reform fail" (p. 22).

Implementation of Computer as an Innovation

Fullan (1992) analyzed the factors of implementation in a case study of a large-scale implementation of microcomputers in Ontario schools. He found that the implementation of microcomputers in the classroom to be both a "policy phenomenon" and an "innovation problem" (Fullan, p. 28). It is a policy phenomenon when adoption of computer technology is initiated and supported by school districts. It is an innovation problem when teachers or community groups attempt to make more effective use of microcomputers.

Criteria for Implementation of Computer Technology

Fullan (1992, p. 30) pointed out that ". . . implementation is a developmental process of change for teachers attempting to use an innovation, which can involve alteration in materials, instructional practices and beliefs about the teacher/learning process." Fullan (1991) listed the following criteria for the successful implementation of innovations in the change process: (a) the use of "new or revised materials," (b) the use of new "teaching approaches," and (c) the "alteration of beliefs" (p. 37).

As far as the adoption of using new hardware as an innovation for educational purposes is concerned, field data collected by Fullan indicated that "microcomputer implementation is often a difficult experience even for interested teachers using high-quality software with good organizational supports" (Fullan, 1992, p. 33). With regard to the use of new teaching approaches, Fullan thought that the main factor for successful implementation seemed to be the amount of collaboration among teachers learning from each other and solving scheduling facility or computer laboratory problems. This observation is supported by Schwarz's data (1997) in which teachers expressed the need for a team approach.

According to Fullan (1992), the changes in beliefs are closely related to the successful implementation of an innovation. Individuals affected by changes have to develop an understanding of the innovation being adopted. This understanding may lead to changes in beliefs in teaching and learning.

The Change Process

According to Fullan (1992), implementation is a process of change for teachers. The four phases of the process of change for innovations are: (a) initiation and participation, (b) pressure and support, (c) changes in behaviour and beliefs, and (d) the overriding problem of ownership or institutionalization.

Initiation.

Active initiation can be provided by school districts to give the impetus and to build momentum for the innovation to get started. The role of the district is to "provide the combination of pressure and support needed to influence and co-ordinate teacher development and school development over time" (Fullan, 1992, p. 24).

Pressure and support.

Implementation of successful projects "always include elements of both pressure and support." Change occurs when "pressure has built up that leads to action" (Fullan, p. 25).

Changes in behaviour and beliefs.

The link between implementation and innovation lies in how new ideas are dealt with effectively by alterations in "behaviours and beliefs" (Fullan, 1992, p. 22). Change in belief occurs when new meaning is discovered from changes in behavior as a result of implementing an innovation. "True understanding, however, comes only when teachers are given opportunities and time to work with the innovations in the classroom and to talk about what they are doing with others" (Fullan, 1992, p.31). Fullan reiterated that "changes in behaviour. . . are at the core of implementation" (p.22).

Ownership or institutionalization. Ownership or institutionalization occurs at the "end of a successful change process" (p.26). Institutionalization refers to the final stage of successful implementation when the innovation is clearly proven to be usable, effective and acceptable.

Effective planning is one of the essential elements of successful implementation of an innovation. From a case study of the implementation of computers as an innovation on a large-scale in Ontario schools, Fullan (1992) found the main focus of planning to be: (a) the acquisition and distribution of hardware to schools, (b) the provision of workshops for staff development, and (c) the creation of resource personnel positions for consultation and on-going support. He reported that planning for institutionalization is "chiefly a responsibility of administrators" (p. 41) after the adoption of innovations has been initiated by the district. He further suggested that "there is clearly a need for research to document working models for implementation,. . . about implementation progress and user concerns at the school system and school levels" (p. 49).

Summary of Literature Review

In summary, the review of the literature shows that research is needed in the adoption and implementation of computer technology and on the impact of computer technology programs at district and local levels. Generally, the literature demonstrated that the implementation of computer technology should be looked at as an embedded innovation problem within the process of change. To understand why computer technology is not being adopted and implemented in the educational setting for teaching and learning, further research must be conducted on the factors which influence the usage of computer technology in schools at system or local levels.

CHAPTER III

RESEARCH METHODOLOGY

The author of this study took the positivist standpoint and gathered data mainly from a survey for an ex post facto study. Ex post facto studies or after-the-fact natural experiments are defined by Krathwohl (1993) as "... studies in which the data are assembled after the presumed cause and effect occurred in an attempt to demonstrate a causal relationship" (p. 728).

To add depth of understanding to the study, seven subjects were also interviewed. Findings from both quantitative and qualitative data are reported.

Research Question

This study was designed to address the question: What impact did the Technology Incentive Program have on teachers with regard to computer usage? The research question was broken down into sub-questions so that the impact of the first year of the TIP could be examined in detail. Sub-questions are listed in Chapter One.

The Technology Incentive Program

In July, 1996, a large school board in Western Canada approved $753,000 to start a TIP whereby 230 teachers were given a computer for their personal use for one year and approximately three weeks of training in its use. The funding was being used to sustain the project for three years, from 1996 to 1999.

The TIP was initiated, planned and promoted by the district which organized the instructional program and personnel, and supplied the computer systems. Teachers of the district were informed about the TIP and teachers who were novice users of computer technology were asked to volunteer for the program. The teachers who volunteered for the program were asked to contribute the time to learn the basics of a new computer platform in a two-week summer session, as well as four Saturday sessions. Since funding was limited, the administrator of the school was asked by the district to nominate some of the teachers who volunteered for the program. The following criteria were used for the selection of teachers for the Technology Incentive Program: The teacher should be a novice user of the computer platform on which the training will occur, that is, either Windows 95 or Macintosh platform-specific machines. While the teacher must volunteer to participate in the program, he or she must be nominated by the school principal. Of the 371 novice computer users nominated by their schools, 230 were successful in applying for the program. The school board which initiated the program ensured that at least one teacher from each school that applied gained acceptance into the program. One hundred and sixty five schools participated in this program during 1996-1997.

Sixteen summer workshops comprised a mandatory course on computer basics for the TIP participants. Every participant was successful in getting their first choice of workshop dates that they had asked for. The workshops included sessions on: (a) unpacking and setting up the computer system, (b) learning about the operating systems of either Windows 95 or Macintosh system 7.5, (c) learning how to use word processing software, using either MS Word or ClarisWorks; (d) learning about presentation through MS PowerPoint or Claris Works, (e) learning about CD-ROM resources such as Encarta and Canadian Encyclopedia, and (f) learning about the Internet.

Saturday workshops were offered in language arts, mathematics, science, and social studies to teachers in Divisions One and Two (grades one to six). Workshops on word processing across the curriculum, spreadsheets, database were offered to teachers of Divisions Three and Four (grades seven to twelve).

TIP Teachers were allowed to choose the computer system they preferred. One hundred and fifty seven teachers chose Windows 95 and 73 teachers chose Macintosh system 7.5 computers. Sixty-seven percent of the teachers selected to keep the computers at home during their year of participation in TIP.

The computer systems ***on loan*** to teachers were up-to-date (July, 1996) and included educational software. Details of the systems on loan to teachers are as follows: Teachers who chose the Windows platform were given a Windows 95 computer (Intel Pentium 120 Mhz; 16 mB RAM; 6X speed CD-ROM; 1.2 gB HD; either 28.8 modem or network card). They were also given a Lexmark 1020 inkjet printer and software packages which included MS Office suite, Canadian Encyclopedia, and MS Encarta.

Teachers who chose the Macintosh platform were given a Macintosh computer (M75 Mhz; 16 mB RAM; quad speed CD-ROM; 1 mB HD; 14.4 modem). They were also given an Apple StyleWriter 1200 grayscale inkjet printer and software packages which included ClarisWorks, Canadian Encyclopedia, and MS Encarta.

Teachers were given the option of purchasing the TIP computers at a price, determined by the district, at the end of the year in June, 1997 when the first TIP was completed. The computers which were not purchased by the teachers were returned to the schools to which the teachers belonged. The individual school then had the option of purchasing the computer or sending it back to the district, so that it could be sold to other schools for market value. The revenues generated by the sale of the computers for the first TIP were used to fund the new computer systems for the second year of TIP.

One hundred and sixty five schools participated in the first year of TIP. Larger schools received more computer systems but every school that applied for the first TIP received at least one computer. In total, 106 schools received one computer system, 51 schools received two systems, six schools received three systems and two schools received four systems.

Research Methodology

The target population for this study consists of teachers who are novice-users of computer technology and who would volunteer to participate in programs similar to the TIP. The accessible population comprised of all of the following people: (a) teachers who participated in the TIP in a large school district in Western Canada, between July, 1996 to June, 1997 and (b) teachers who applied for the program but were not selected for the TIP (non-TIP teachers) for the same period.

Sample of Study

The 148 (64%) TIP teachers and the 20 (14%) non-TIP teachers who responded to the survey for the research formed the sample group. Seven TIP participants were chosen as a haphazard volunteer sample. The interviewees were selected on the basis of the grade levels they taught. Two senior high, two junior high and three elementary teachers were chosen for the interviews with the aim of trying to gain an insight into the impact of the TIP at the different grade levels.

Instrumentation

Teachers were asked to volunteer information about the following through the survey: (a) demographic information for sample stratification and correlation, (b) nature of the TIP participation, (c) participants' level of expertise in computer use, (d) comparison of number of hours of computer use before and after the TIP, (e) computer usage and interest, (f) the TIP and computer access, (g) participants' perceived beliefs and values toward the use of computers, and (h) influence other than the TIP factors. See Appendix A and Appendix B for the surveys of the TIP participants and the non-TIP participants.

Validation. The survey was created to address the sub-questions. Two TIP participants and two non-TIP teachers were asked to pilot the survey by completing it in the presence of the author. All questions from each individual were answered; problems were discussed and suggestions for improving the questions were noted. Items that were unclear were revised and the data obtained from the pilot testing were discarded. After all the revisions were made, the questionnaire was validated by the researcher's supervisor.

Data Collection

How Data Were Collected

The researcher phoned all 165 schools involved in the TIP to verify the whereabouts of the TIP participants. Surveys were sent directly to the 230 TIP teachers in February, 1998. A different survey was designed for the non-TIP teachers.

The original record kept by the school board indicated that the number of unsuccessful applicants for the first year of the TIP was 141. However, no record could be found with regard to the names and locations of these unsuccessful applicants. The Principals were asked to identify the non-TIP teachers and to distribute the surveys to them. The surveys were sent to the principals of the 165 district schools who participated in the first TIP during 1996-1997.

A cover letter was sent along with the questionnaire to inform the respondents of the details of the research project. All respondents were asked to seal their completed surveys in a return-envelope that was provided for them. They were to complete the surveys and return them to the author via the School Board mail-service. In order to ensure the anonymity of the respondents, they were asked not to identify themselves on the survey instrument. Instead, respondents were to return a notification form, under separate cover, to the researcher to let her know that they had responded to the survey. Respondents were asked to send the notification form a few days after they had completed the questionnaire so their names were not associated with any specific completed survey. At the end of a three week period, teachers who did not return the survey were contacted by mail and asked to complete the survey. Eleven teachers notified the researcher that they did not wish to participate in the survey.

Seven TIP teachers were contacted by phone to make arrangements for in-depth interviews. The qualitative data were collected through interviews which were about one and a half hours in duration. In total, six interviews were conducted in January, 1998. There was one interview in which two teachers were interviewed together from the same school. See Appendix C for the list of the questions that were asked in the interview.

Trustworthiness of the Data

The Data collected in this study were triangulated from three sources. Triangulation is defined as the use of a variety of methods to collect data to enhance the validity of a study. Firstly, data gathered from the survey were used to give credibility to the study. The survey was pilot tested before data were gathered. Second, data gathered from interviews of the TIP participants and the non-TIP group added an additional perspective to the impact of the TIP on the teachers. Thirdly, to ensure that the researcher accurately represented the views of the teachers being interviewed, the participants were asked to validate the transcripts. In other words, membership checking was used. The respondents were asked to comment on the researcher's interpretation of what they have said in the interviews. In addition, an audit trail of the process of the research was kept. Eight individuals were asked to do independent open-coding of the transcriptions. Suggestions from these individuals were noted and incorporated into the themes of the relevant topics for the study.

Ethical Consideration

Participants of the survey were informed in writing that (a) participation was voluntary, (b) they had the option to opt out by not responding, (c) all the collected data were kept confidential, (d) the notification form was used for follow-up purposes and for draw prizes, (e) the names identified by the notification form did not link to the data, thus the anonymity of respondents was ensured, and (f) all data would be destroyed at the completion of the study. Appendix D contains the letter which included the information for the confidentiality of the participants.

Data Analysis

Response Summary

Five TIP teachers were not accessible for the survey since two of them moved out of the province and three were on leave of absence. Of the 150 surveys returned by the TIP teachers, 148 of them (64%) were usable for data analysis. Of the 21 surveys returned by non-TIP teachers, 20 of them (14%) were usable for data analysis.

t Tests

After data were collected from the sample group, they were analyzed using SPSS and the impact of the TIP was explored through descriptive data. With the alpha level set at 0.05, the comparison of the following data were obtained by using paired t tests on:

1. the level of expertise with regard to computer technology the TIP participants perceived they had, before and after the TIP training.
2. the number of hours the TIP participants used computers, for teaching and non-teaching purposes, before and after the TIP training.

The same procedure used for the TIP participants as described above were used for the non-TIP teachers. A comparison of the TIP and non-TIP teachers was not made since sample from the non-TIP teachers was too small and the validity of the small sample is seriously questioned.

Grouping Items with Factor Analysis

Factor analysis was used to arrange and manage the data collected in sections F, J and K of the survey for the participants of the TIP so that the variables contained in those sections could be described by a few factors and be reported by the appropriate themes.

Factor analysis was not used for data collected from section G of the survey (survey items for which teachers did not receive training) since there were a large number of respondents who reported not using the items for which they were being asked to respond to. Due to listwise deletion, the accuracy of factor loading would be seriously affected due to the large number of respondents who do not use the items they are asked to respond to.

The varimax extraction procedure was used for the exploratory factor analysis mentioned above. Factor loadings greater than 0.4 were used for grouping data collected for the sub-questions. Whenever double loading occurred, the higher loading was chosen. See Appendix E for details of factor loadings. The statements grouped by the factors were examined for content in order to determine common themes that could be derived from them. For example, in Appendix E, statements V52 and V48 exhibited factor loadings higher than 0.4 on a construct which the researcher named *computer usage at home*.

Content Analysis

Content analysis was used to analyze data obtained from the two open-ended questions of the survey (See Appendix A) for both the TIP and non-TIP groups. Content analysis in this research project refers to the technique of systematically counting the number of times each unique response occurs in the answers to the open-ended questions. Results from content analysis were also converted into percentages for reporting purposes.

Interview Data

Interview data were transcribed, verbatim, from the taped interviews. A filing system was created to maintain, index and classify coded data. Data were read thoroughly and annotated according to topics, themes and issues so that patterns could be sought systematically from the major topics, sub-topics and themes.

CHAPTER IV

PRESENTATION OF FINDINGS: SURVEY OF TIP PARTICIPANTS

This chapter presents the findings obtained from the survey of teachers who participated in the TIP. The total number of usable surveys was 148, which accounted for 64% of the TIP teachers. Within this chapter, sub-questions (to the Research problem) were placed at the beginning of each topic for the presentations of results after demographic data were presented. With the exception of percentages reported in the tables, all reported percentages in this study are rounded off to the nearest integer.

Table 4.1. Demographic Data of TIP Respondents

Sex	Frequency	Percentage of Frequency
Female	112	75.7
Male	36	24.3
Division	**Frequency**	**Percentage of Frequency**
Division 1	63	42.6
Division 2	39	26.4
Division 3	31	20.9
Division 4	25	16.9

Note. The total number of response was 148, however some teachers indicated that they teach in more than one division, therefore total percentages were in excess of 100 % and frequencies were in excess of 148.

Table 4.1shows that the majority (76%) of the TIP participants were female and that 69% of the TIP teachers were elementary teachers (43% taught in Division One and 26% in Division Two).

TIP Teachers' Computer Related Activities After TIP

What was the impact of the TIP on the participants in interest shown in computer-related activities? Table 4.2 shows percentages of teachers participating in computer related activities after TIP training.

Table 4.2. TIP Teachers' Computer Related Activities after TIP

Computer Related Activities Attended After TIP Training [a]	Yes %	No %	Missing %
Attended In-services on computer technology after TIP training	**60.8** **(90)**	**39.2** **(58)**	**0** **(0)**
Read articles, journals or magazines on computer technology	**64.2** **(95)**	**35.8** **(53)**	**0** **(0)**
Attended computer conference related to computer technology	**25.7** **(38)**	**74.3** **(110)**	**0** **(0)**
Used microcomputer to inservice staff	**33.8** **(50)**	**65.5** **(97)**	**0.7** **(1)**

Note. Numbers in brackets denote frequencies of responses

[a]n = 148

The results in Table 4.2 showed that 61% of the teachers stated that they had attended inservice sessions related to computer technology and 64% of them read articles, journals or magazines after they received training from the TIP. About a quarter (26%) of the respondents attended conferences related to computer technology after the TIP training. Thirty-four percent of the TIP teachers provided inservice activities to their school staff after receiving TIP training. The term *inservicing staff* referred to TIP teachers giving workshops or sessions with the aim of providing professional development for their colleagues.

Impact of Having a Computer For One Year

What was the impact of having a computer for one year on the TIP participants? Table 4.3 shows the results of TIP participants' perception of the impact of having a computer for one year with regard to computer usage.

Table 4.3. Influence of TIP Computer on Teachers' Usage of Computer

Computer Usage [a]	NI 1 (%)	SI 2 (%)	MI 3 (%)	CI 4 (%)	No Ans (%)	Mean	sd
Did the computer (provided to you by TIP) increase your use of computer at home or at work?	1.4 (2)	4.1 (6)	25.7 (38)	68.2 (101)	0.7 (1)	3.6	0.6

Note. Numbers in brackets denote frequencies of responses

1= no increase; 2= slight increase; 3= moderate increase; 4= considerable increase; and No Ans= no answer.

[a] n = 148

Sixty eight percent of the teachers perceived having received the computer for one year to be a factor for their considerable increased use of computers.

TIP Participants' Purchase of Computer as Result of TIP

What was the percentage of teachers who perceived the TIP to be the major influence for their purchase of a computer after they took the TIP training? Table 4.4 shows the percentage of teachers who reported their perception of the impact of the TIP on the purchase a computer. Of the 41% of teachers who purchased a computer after having receiving training from the TIP, 30% of them perceived the TIP to be the major influence for the purchase (or 12% of all TIP teachers in the sample).

Table 4.4. Influence of TIP Training on Purchase of Computer

Computer Purchasing	Yes %	No %	No Ans %
Did you purchase a computer after TIP? (n=148)	40.5 (60)	57.4 (85)	2.0 (3)

If Answer Is Yes to above question	Yes %	No %	N/A %	No Ans %
If your answer to the above question is yes, was TIP the major influence on your purchase of the computer? (n=148)	30.4 (45)	9.5 (14)	58.1 (86)	2.0 (3)

Note. Numbers in brackets denote frequencies of responses

N/A= not applicable (teachers who did not purchase computers checked this category).

No Ans= no answer.

Influence of TIP Training on Perception of Level of Expertise

What was the impact of the TIP on participants' perception of their level of knowledge and skill in computer usage before and after they completed the TIP? Teachers were asked to rate themselves, on a scale of *one to ten*, on their perceived level of expertise in computer usage for the periods before and after they received training in the TIP. On the survey, the scale of *one to ten* was defined for teachers as follows. *One* refers to teachers who view themselves as having no knowledge and skill in computer technology; and *ten* refers to teachers who view themselves as having expert knowledge and skill in computer technology.

Table 4.5 shows results of a paired t test comparing teachers' perceived knowledge and skill in computer usage before and after TIP training.

Table 4.5. Influence of TIP Training on Perception of Level of Expertise

Perceived Level of Expertise by teachers [a]	Mean	sd	df[b]	t value	2-tail sig
Knowledge and skill in computer technology prior to July 96 or before Tip Training	2.7	1.5	147	31.6	.000*
Knowledge and skill in computer technology as of today, after TIP training.	6.3	1.5			

[a] n = 148 [b] df= degree of freedom

*p< .05

The TIP participants perceived that their knowledge and skill in using computers after the TIP training increased significantly [t (147)= 31.6, p= < .05] over the specified times.

A Note on t Test Results

With regard to the paired t tests that were done to determine the impact of the TIP on participants' level of knowledge and skill in computer-usage and the impact of the TIP on computer usage for teaching and non-teaching purposes, interpretation of results may be inaccurate. When multiple t tests are done on many dependent variables, the results of the paired t tests could be obtained erroneous by chance alone. With alpha set at 0.05, the chances of being wrong is five in a hundred or one out of 20 times.

Influence of TIP Training on Computer Usage for Teaching Purposes

In using computers for teaching purposes, what was the impact of the TIP on the participants with regard to number of hours of computer usage? Table 4.6 shows results of a paired t test, comparing computer usage for teaching purposes before and after the TIP. Teachers were asked to report the number of hours they used the computer for teaching before and after they received training in the TIP.

Table 4.6. Paired t Tests on TIP training For Teaching Purposes

Number of Hours of Computer Usage for Teaching Purposes [a]	Mean	sd	df[b]	t value	2-tail sig
Hours per week in using computer for teaching prior to July 96 or before Tip Training	2.1	3.3	146	12.0	.000*
Hours per week in using computer for teaching as of today, after TIP training.	7.8	6.8			

[a] n = 147 [b] df= degree of freedom

*p< .05

The results of the paired t test in Table 4.6 showed that teachers reported a significant [t (146)= 12.0, p= < .05] increase in the number of hours per week they used the computer for teaching purposes after they received training in the TIP.

Influence of TIP Training on Computer Usage for Non-Teaching Purposes

In using computers for purposes other than teaching, what was the impact of the TIP with regard to the number of hours of computer usage? Table 4.7 shows the results of the paired t test which reported a significant [t (144)= 9.0, p= < .05] increase in the number of hours per week teachers used the computer for non-teaching purposes after they received training in the TIP.

Table 4.7. Paired t Tests on TIP training For Non-teaching Purposes

Number of Hours of computer Usage for Non-Teaching Purposes [a]	Mean	sd	df[b]	t value	2-tail sig
Hours per week in using computer for purposes other than teaching prior to July 96 or before Tip Training	0.7	1.4	144	9.0	.000*
Hours per week in using computer for purposes other than teaching as of today, after TIP training.	2.8	3.4			

[a] n = 145 [b] df= degree of freedom

*p< .05

Factor Analysis

With the exception of Table 4.17, factor analysis was used to group all the statements reported in Tables 4.8 to Tables 4.22. (See sections F, J and K of the survey in Appendix A). Twelve themes which emerged from the twelve factors were named by the researcher. The organization of the presentation of findings below are consistent with the organizational format presented in Appendix E. The twelve themes which are listed in Appendix E are presented in three sections.

The following section is comprised of factors which addressed the themes of (a) teachers' attitude, (b) influence of TIP and non-TIP factors on teachers usage of computers (c) teachers' opinions about computer usage, and (d) computer usage at home. The themes in each factor are identified through the sub-headings of each of these sections.

TIP Teachers' Attitude, Confidence and Proficiency in Computer Usage

What was the impact of the TIP on the participants with regard to their attitudes towards the use of computers? Table 4.8 summarized the results of teachers' responses concerning their attitude, confidence and proficiency in computer usage.

Table 4.8. TIP Teachers' Attitude, Confidence and Proficiency in Computers

Survey Questions	SD 1 %	D 2 %	UD 3 %	A 4 %	SA 5 %	No Ans %	Mean	sd
I feel more confident with using a computer as a result of the Technology Incentive Program.	0 (0)	1.4 (2)	2.7 (4)	39.2 (58)	56.8 (84)	0 (0)	4.5	0.6
I feel more confident in using a computer for word- processing as a result of TIP.	0 (0)	4.7 (7)	4.7 (7)	39.9 (59)	50.7 (75)	0 (0)	4.4	0.8
I feel more confident in using a computer for lesson- planning purposes as a result of TIP.	2.0 (3)	9.5 (14)	27.0 (40)	28.4 (42)	31.8 (47)	1.4 (2)	3.8	1.1
I feel more confident in using a computer for delivering instruction as a result of TIP.	2.0 (3)	15.5 (23)	31.1 (46)	29.7 (44)	19.6 (29)	2.0 (3)	3.5	1.0
As a result of the Technology Incentive Program, I have a more favorable attitude towards the use of computers in general.	0.7 (1)	4.1 (6)	6.8 (10)	37.8 (56)	50.7 (75)	0 (0)	4.3	0.8
I am using computers more at work as a result of TIP.	0 (0)	4.7 (7)	6.1 (9)	37.2 (55)	51.4 (76)	0.7 (1)	4.4	0.8
As a result of TIP, I am more proficient in using computer technology.	0 (0)	2.7 (4)	3.4 (5)	40.5 (60)	52.7 (78)	0.7 (1)	4.4	0.7

Note. Numbers in brackets denote frequencies of responses

1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly agree; and

No Ans= No Answer.

n= 148

Attitude and confidence in general computer usage. Ninety six percent of the teachers surveyed reported that they felt more confident with using a computer as a result of the TIP (39% agreed and 57% strongly agreed).

Attitude and confidence in word-processing. Ninety one percent of the teachers felt more confident in using a computer for word processing as a result of the TIP (40% agreed and 51%strongly agreed).

Attitude and lesson planning. A total of 60% of teachers surveyed indicated that they agreed with the statement that "I feel more confident in using a computer for lesson planning purposes as a result of the TIP" (28% agreed and 32% strongly agreed).

Attitude and delivering instruction. Fifty percent of the teachers reported that they felt more confident in using a computer for delivering instruction as a result of the TIP (30% agreed and 20% strongly agreed). Thirty one percent were undecided about feeling more confident in using a computer for delivering instruction.

Attitude and usage of computers. Eighty nine percent agreed or strongly agreed that they had a more favorable attitude towards the use of computers in general (38% agreed; 51% strongly agreed). Only 5% of the respondents disagreed or strongly disagreed with them.

Proficiency. Eighty eight percent of the teachers agreed or strongly agreed (37% agreed 51% strongly agreed) that they were using the computer more at work as a result of the TIP. Ninety four percent of the teachers agreed or strongly agreed (41% agreed; 53% strongly agreed) that as a result of the TIP, they were more proficient in using computer technology.

Influence of TIP and Non-TIP Factors

What were some factors, other than the TIP, which influenced TIP teachers' usage of computers? The responses to the questions listed in Table 4.9 addressed the issues of the influences of TIP and non-TIP factors with regard to teachers' increased computer usage.

Table 4.9. Influences of TIP and Non-TIP Factors on Usage of Computers

Survey Question	SD 1 %	D 2 %	UD 3 %	A 4 %	SA 5 %	No Ans	Mean	sd
There are other factors, (other than TIP), which influence my use of computers.	1.4 (2)	6.1 (9)	10.1 (15)	56.8 (84)	23.6 (35)	2.0 (3)	4.0	0.8
I am using computers more at work as a result of factors other than TIP.	3.4 (5)	20.9 (31)	16.2 (24)	39.2 (58)	19.6 (29)	0.7 (1)	3.5	1.1
I am using computers more as a result of both TIP and other factors.	0.7 (1)	6.1 (9)	8.8 (13)	41.2 (61)	42.6 (63)	0.7 (1)	4.2	0.9

Note. Numbers in brackets denote frequencies of responses

1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree; and

No Ans= No Answer

[a] n = 148

The reasons cited for the increased usage of computers were attributed to both the TIP and to factors other than the TIP. Table 4.9 shows that 81% of the respondents agreed or strongly agreed (57% agreed; 24% strongly agreed) that there were other factors, other than the TIP, which influenced their use of computers. Fifty nine percent of the respondents agreed or strongly agreed that they were using computers more at work as a result of factors other than the TIP (39% agreed and 20% strongly agreed). Eighty four percent of the TIP participants agreed or strongly agreed that they were using computers more as a result of both the TIP and other factors (41% agreed and 43% strongly agreed).

Open-ended Questions and Factors Which Influenced Computer Usage

In order to identify the factors which influenced the TIP participants' usage of computers, teachers were asked to respond to the following open-ending questions in the survey:

1. List the main factors which increased your computer usage, as a result of the TIP. (Note:131 teachers responded to this question)
2. List the main factors which increased your computer usage, not related to the TIP. (Note:120 teachers responded to this question)

Analysis of Open-ended Questions

Content analysis was used to analyze data obtained from the open-ended questions of the survey. Results were converted in percentages for reporting purposes. Teachers identified many factors which increased computer usage as result of the TIP as well as factors which increased computer usage unrelated to the TIP.

TIP factors which increased usage. Of the 148 teachers who responded to the survey, 131 of them (89%) responded to the first open-ended questions. Table 4.10 summarized the results of data from the 131 TIP teachers who responded to the first open-ended question in which they listed the main factors that increased their computer usage as a result of the TIP. Sixty out of 131 (46%) of the teachers who responded identified the TIP computer on loan to them as one of the factors which increased computer usage. Forty one out of 131 teachers (31%) cited confidence in ability to handle and use a computer as another reason for their increased use of computer after having received training from the TIP.

Table 4.10. Factors Which Increased Computer Usage as Result of the TIP

Main Factors Which Increased TIP Teachers' Computer Usage As a result of the TIP. [a]	Frequency of response	% of frequency
TIP computer on loan to them	60	46%
Confidence in ability to handle and use a computer	41	31%
Increased knowledge of the use of computers and familiarity with computer applications	20	15%
Opportunity to learn, hands-on experience and training during the two weeks in TIP training during the summer of 1996	14	11%
Having opportunity to practice in using a computer	13	10%
Having the one year of time to use the computer	10	8%
Learning about word processing during the TIP	8	6%
The instructors of the TIP	6	5%
Software provided with the TIP computer and familiarity with the software due to the TIP training	6	5%
Printed material from the TIP summer course	5	4%
Speed and skill in using computer as result of the TIP training	2	2%
The TIP Saturday sessions during the year	2	2%
Data base	1	1%

Note. **Percentage exceed 100% since respondents gave more than one answer to each open-ended question.**

[a] n=131

Influence of factors other than TIP. Table 4.11 summarized the responses of the TIP teachers to the second open-ended question in which they listed the main factors that increased their computer usage not related to the TIP.

Table 4.11. Factors Which Increased Computer Usage not Related to the TIP.

Main Factors, Unrelated To the TIP Which Increased TIP Teachers' Computer usage. [a]	Frequencies of Responses	Percentage of Frequencies
Necessity to learn to use computers for report card purposes and needs of students	24	20%
Help from family, colleagues and friends	20	17%
Having access to computers in school or classroom	19	16%
Personal interest, desire and commitment	14	12%
Professional development	13	11%
Having access to computers at home	10	8%
School-wide focus, support system and school board priority on technology	9	8 %
Classroom planning	9	8%
Software	6	5%
Administrative support	5	4%
Change in job descriptions	3	3%
Awareness of importance of computer for future usage	3	3%
Bought a computer	3	3%
Computer lab at school	2	2%
Confidence with computer	2	2%
Opportunity to practice	2	2%
Curiosity to learn	1	1%
Help at school after summer training	1	1%
Being the leader in school in computer technology	1	1%
Games	1	1%
Learning about computer from television	1	1%
Knowledge of computer before the TIP	1	1%

Note. Percentage exceed 100% since respondents gave more than one answer to each open-ended question.

[a] n=120

Factors, not related to TIP, which influenced the increased computer usage among the TIP participants are listed in Table 4.11. Of the 148 teachers who responded to the survey, 120 teachers (81%) responded to the second open-ended question. Twenty four out of 120 (20%) of the respondents identified necessity to learn to use computers for report card purposes and needs of students as a reason for the increased use of computers. Twenty out of 120 (17%) respondents identified help from family, colleagues and friends as another factor for increased usage. Nineteen out of 120 (16%) reported having access to computers in school or classroom to be another reason for the increased use of computers.

Teachers' Opinions About the Use of Computers Usage

What was the impact of the TIP on the participants with regard to their attitudes towards the use of computers? The responses to the questions listed in Table 4.12 mainly dealt with teachers' opinions about using computers in teaching and learning.

Eighty eight percent of respondents agreed or strongly agreed that computer technology should be used for teaching and learning purposes. Eighty five percent of the teachers disagreed or strongly disagreed with the statement that "computer technology is just a fad" (36% disagreed and 49% strongly disagreed). Ninety two percent of the teachers agreed or strongly agreed that using computer technology is an effective way to enhance learning (61% agreed and 31% strongly disagreed).

Table 4.12. Opinions About the Use of Computers for Teaching and Learning

Survey Question[a]	SD 1 %	D 2 %	UD 3 %	A 4 %	SA 5 %	No Ans	Mean	sd
I think computer technology should be used in the classrooms for teaching and learning purposes.	0 (0)	3.4 (5)	9.5 (14)	46.6 (69)	40.5 (60)	0 (0)	4.2	0.8
I feel that the use of computers for teaching is just a fad.	48.6 (72)	35.8 (53)	10.8 (16)	2.7 (4)	0 (0)	2.0 (3)	1.7	0.8
Using computer technology is an effective way to enhance learning.	0.7 (1)	2.0 (3)	5.4 (8)	60.8 (90)	31.1 (46)	0 (0)	4.2	0.7

Note. Numbers in brackets denote frequencies of responses

1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree; and

No Ans= No Answer

[a]n = 148

TIP Teachers' Computer Usage at Home

In using computers for purposes other than teaching, what was the impact of the TIP with regard to the number of hours of computer usage? The responses to the questions listed in Table 4.13 assessed teachers' usage of computers at home. Sixty six percent of teachers agreed or strongly agreed that they were using computers more at home as a result the TIP (30 % agreed and 36% strongly agreed). Twenty four percent of the teachers disagreed (14% disagreed; 10% strongly disagreed) with them.

Thirty five percent agreed or strongly agreed (22% agreed;13% strongly agreed) that they were using computers more at home as a result of factors other than the TIP. However, 39% percent of the teachers disagreed or strongly disagreed (27%

disagreed; 12% strongly disagreed) with them. Twenty percent of the teachers were undecided as to whether they agreed that their usage of computers were affected by factors other than the TIP.

Table 4.13. TIP Teachers' Computer Usage At Home

Survey Question ᵃ	SD 1 %	D 2 %	UD 3 %	A 4 %	SA 5 %	No Ans	Mean	sd
I am using computers more at home as a result of TIP.	10.1 (15)	14.2 (21)	4.1 (6)	30.4 (45)	35.8 (53)	5.4 (8)	3.7	1.4
I am using computers more at home as a result of factors other than the Technology Incentive Program	12.2 (18)	27.0 (40)	19.6 (29)	21.6 (32)	12.8 (19)	6.8 (10)	3.0	1.3

Note. Numbers in brackets denote frequencies of responses

1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree; and

No Ans= No Answer

ᵃn = 148

The following section comprised of factors which addressed the themes of (a) use of the Internet and multimedia software, (b) training on use of computer applications, and (c) use of word processing and planning.

Use of Internet and Multimedia Software

What was the impact the TIP on the participants in the usage of the Internet and multimedia software? Table 4.14 shows teachers' usage of the Internet and multimedia software after they received training from the TIP.

Table 4.14. Influence of TIP Training on Internet and Multimedia Software

Training Received from TIP on Internet and Multimedia Software [a]	NI 1 %	SI 2 %	MI 3 %	CI 4 %	No Ans %	DNU %	Mean	sd
Internet	4.7 (7)	20.3 (30)	20.3 (30)	39.2 (58)	.7 (0)	14.9 (5)	3.1	1.0
Power Point or Slide Show	16.9 (25)	25.7 (38)	11.5 (17)	14.9 (22)	0 (0)	31.1 (46)	2.4	1.1
Desk Top Publishing with Graphics	9.5 (14)	23.6 (35)	26.4 (39)	24.3 (36)	.7 (1)	15.5 (23)	2.8	1.0
CD ROM	11.5 (17)	33.8 (50)	27.0 (40)	18.9 (28)	0 (0)	8.8 (13)	2.6	1.0
Audio CD	12.8 (19)	22.3 (33)	16.2 (24)	21.6 (32)	.7 (1)	26.4 (39)	2.6	1.1
Clip Art/ Graphics	13.5 (20)	25.7 (38)	23.0 (34)	30.4 (45)	0 (0)	7.4 (11)	2.8	1.0

Note. Numbers in brackets denote frequencies of responses

1= no increase; 2= slight increase; 3= moderate increase; 4= considerable increase;

No Ans= no answer; and DNU= do not use

[a] n = 148

Table 4.14 showed that of the 85% of the teachers who reported having used the Internet, more than a third of them (39%) reported considerable increased use of the Internet after having received training from the TIP. Fifteen percent of teachers did not use the Internet even after having received training.

With regard to multimedia software, 26% of the teachers perceived slight increase in the use of Power Point or Slide Show. Twenty six percent of the respondents reported moderate increase in the use of desktop publishing with graphics. Thirty four percent of them indicated that they perceived slight increase in the use of CD ROM. While 22% of the teachers reported slight increase in the use of audio CD, 26% of them do not use the item. Almost a third of teachers (30%) reported a considerable increase in using clip art and graphics. Only 7% of the respondents reportedly did not use clip art and graphics. Overall, the findings showed that the TIP training had a positive impact on increasing the teachers' use of the Internet.

Training on Use of Computer Applications

What was the impact of the TIP on the participants in the use of transferring data between applications, spreadsheet, and data base? Table 4.15 shows teachers' perceived increased usage of the application software since July, 1996 after they received training from the TIP.

Table 4.15. Influence of TIP Training on Use of Computer Applications

Training Received from TIP on applications [a]	NI 1 %	SI 2 %	MI 3 %	CI 4 %	No Ans %	DNU %	Mean	sd
Transferring data between applications	16.9 (25)	22.3 (33)	17.6 (26)	16.2 (24)	0.7 (1)	26.4 (39)	2.5	1.1
Spreadsheet	14.9 (22)	27.7 (41)	21.6 (32)	11.5 (17)	0.7 (1)	23.6 (35)	2.4	1.0
Data Base	16.2 (24)	32.4 (48)	14.9 (22)	10.8 (16)	3.4 (5)	22.3 (33)	2.3	1.0

Note. Numbers in brackets denote frequencies of responses

1= no increase; 2= slight increase; 3= moderate increase; 4= considerable increase;

No Ans= no answer; and DNU= do not use

[a]n = 148

Table 4.15 shows that over all, at least 20% of respondents reported that they did not use the computer application programs of transferring data between applications, spreadsheet or data base. The considerable increase reported by teachers, in each of the three application programs, did not exceed 17%. In general, the influence of the TIP training on these three computer application did not seem to have much impact on the participants of the TIP.

Use of Word Processing and Integration With Content Areas

What was the impact of the Technology Incentive Program on the participants in the usage of word processing and integration of computer with content area? Content areas refer to the subjects being taught at schools, for example, language arts. Table 4.16 shows teachers' perceived increased usage of word processing and integration of computer with content areas since July, 1996 after they received training from the TIP.

Table 4.16. Word Processing and Integration of Computer With Content Areas

Training Received from TIP on Word Processing and Planning [a]	NI 1 %	SI 2 %	MI 3 %	CI 4 %	No Ans %	DNU %	Mean	sd
Word Processing	7.4 (11)	15.5 (23)	23.6 (35)	50.0 (74)	0 (0)	3.4 (5)	3.2	1.0
Integration of computer with content areas	10.8 (16)	28.4 (42)	32.4 (48)	23.0 (34)	0.7 (1)	4.7 (7)	2.7	1.0

Note. Numbers in brackets denote frequencies of responses

1= no increase; 2= slight increase; 3= moderate increase; 4= considerable increase;

No Ans= no answer; and DNU= do not use

[a] n = 148

Table 4.16 shows that half of the TIP respondents reported considerable increased usage of word processing after training from the TIP. Of all the components of the TIP training in computer software and applications, word processing seemed to have made the greatest impact on teachers. Only 3% of the teachers were not using word processing after the TIP training.

Twenty three percent of the teachers reported considerable increase in the integration of computer with content areas. Only 4.7% did not integrate computers with content areas in teaching.

Survey Items for Which Teachers Did Not Receive Training

Table 4.17 summarized the results of survey items for which teachers did not receive training. Factor analysis was not used on the data presented on this topic. Thirty two percent of the respondents do not use the item *computer games*. The majority of the respondents do not create web pages (74%), nor do they participate in listserv or usenet groups (78%).

Teachers did not show any considerable increase in the use of games, web page creation or participate in listserv or usenet groups. Of all the items in which teachers did not receive training from TIP, approximately 41% of the teachers perceived that they have considerable increase in the use of computers for electronic mail, without training from the TIP. However, 21% of them do not use electronic mail.

Only 7% of the respondents did not use computer for planning. Twenty eight percent of them reported they have considerable increase in the use of computers for planning. Without direct training in using computers for planning from the TIP, teachers seemed to have been able to increase the use of computer for planning purposes. They did not seem to be able to do so for areas like games, creation of web pages or participation in listserv or usenet groups.

Table 4.17. Survey Items for Which Teachers Did Not Receive Training

Survey Items in which Teachers did not receive training from TIP[a]	NI 1 %	SI 2 %	MI 3 %	CI 4 %	No Ans %	DNU %	Mean	sd
Games	22.3	18.9	16.9	10.1	0	31.8	2.2	1.0
	(33)	(28)	(25)	(15)	(0)	(47)		
Creating Web pages	12.2	4.1	2.0	7.4	0	74.3	2.2	1.3
	(18)	(6)	(3)	(11)	(0)	(110)		
Participation in Listserv or Usenet	8.8	2.7	2.0	8.1	0.7	77.7	2.4	1.4
	(13)	(4)	(3)	(12)	(1)	(115)		
Email Usage	8.1	14.2	16.2	40.5	0	20.9	3.1	1.0
	(12)	(21)	(24)	(60)	(0)	(31)		
Planning for teaching	11.5	19.6	31.8	28.4	1.4	7.4	2.8	1.0
	(17)	(29)	(47)	(42)	(2)	(11)		

Note. Factor analysis was not used on the data presented in this table.

Numbers in brackets denote frequencies of responses

1= no increase; 2= slight increase; 3= moderate increase; 4= considerable increase;

No Ans= no answer; and DNU= do not use

[a]n = 148

The following section comprised of factors which addressed the themes of teachers' requirements for (a) people support, (b) application support, (c) training strategies, and (d) school and administrative support.

People Support Required by Teachers

What were the perceived needs of the TIP participants in order to increase computer usage with students? The following section demonstrates what teachers report they require for implementing computer technology in the classroom.

Table 4.18. People Support Required by Teachers

Survey Questions [a]	SD 1 %	D 2 %	UD 3 %	A 4 %	SA 5 %	No Ans	Mean	sd
In order for me to increase the use of computer technology with students, I require ...								
Assistance in the school from other teachers.	2.7 (4)	12.8 (19)	18.9 (28)	37.8 (56)	26.4 (39)	1.4 (2)	3.7	1.1
Opportunities to work with colleagues as a team.	1.4 (2)	4.1 (6)	16.9 (25)	39.9 (59)	36.5 (54)	1.4 (2)	4.1	0.9
Help in the form of hands-on training.	1.4 (2)	5.4 (8)	10.1 (15)	36.5 (54)	44.6 (66)	2.0 (3)	4.2	0.9
Being shown how to use computers.	9.5 (14)	18.9 (28)	12.8 (19)	25.0 (37)	30.4 (45)	3.4 (5)	3.5	1.4
Continuous training in use of computers to gain confidence in usage.	2.0 (3)	3.4 (5)	8.1 (12)	43.2 (64)	42.6 (63)	.7 (1)	4.2	0.9
Time to acquire computer skills and to learn about computer usage.	1.4 (2)	.7 (1)	6.1 (9)	25.7 (38)	62.8 (93)	3.4 (5)	4.5	0.8

Note. **Numbers in brackets denote frequencies of responses**

1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree; and

No Ans= No Answer.

[a] n = 148

Table 4.18 summarized the results of teachers' responses concerning people support required by teachers. The majority of the TIP teachers showed that they require people support, before they could increase their use of computer technology with students. Sixty four percent of the teachers (38% agreed and 26% strongly agreed) reported that they need assistance in the school from other teachers. Seventy seven percent of the respondents (40% agreed; 37% strongly agreed) reported that they required opportunities to work with colleagues as a team. Eighty two percent of the teachers agreed or strongly agreed that they require help in the form of hands-on training (37% agreed; 45% strongly agreed). Fifty five percent of the teachers agreed or strongly agreed (25% agreed; 30% strongly agreed) that they require being shown how to use computers. Eighty six percent of them also agreed or strongly agreed that they require continuous training in order to gain confidence in computers usage (43% agreed; 43% strongly agreed).

Eighty nine percent of teachers agreed or strongly agreed that in order for them to increase the use of computer technology with students they require support for time to acquire computer skills and to learn about computer usage.

Application Support Required by Teachers

In general, teachers agreed that in order for them to apply the use of computer technology in the classroom, they need (a) access to class sets of curriculum-specific software; (b) more teacher input into decisions about hardware and software purchases; and (c) help in incorporating computers into curriculum.

The responses to the questions listed in Table 4.19 addressed the issue of support required by teachers for the application of computer technology in the classroom. Eighty five percent of the teachers agreed or strongly agreed that, in order for them to increase the use of computer technology with students, they require more curriculum-specific software (28% agreed; 57% strongly agreed). Seventy seven percent of the respondents agreed or strongly agreed that they require access to class sets of software (30% agreed; 47% strongly agreed). Although 66% of the teachers agreed or strongly agreed that they require more teacher input into decisions about hardware and software purchases, 20% of them were undecided about this issue. Eighty five percent of the teachers agreed or strongly agreed that they require help in incorporating computers into the curriculum (41% agreed; 44% strongly agreed).

Table 4.19. Support Required for Application of Technology in Classroom

Survey Questions [a]	**SD 1 %**	**D 2 %**	**UD 3 %**	**A 4 %**	**SA %**	**No Ans**	**Mean**	**sd**
In order for me to increase the use of computer technology with students, I require ...								
More curriculum-specific software.	**0.7 (1)**	**2.7 (4)**	**10.8 (16)**	**27.7 (41)**	**57.4 (85)**	**0.7 (1)**	**4.4**	**0.8**
Access to class sets of software.	**2.0 (3)**	**4.1 (6)**	**12.8 (19)**	**29.7 (44)**	**47.3 (70)**	**4.1 (6)**	**4.2**	**1.0**
More teacher input into decisions about hardware and software purchases.	**2.7 (4)**	**9.5 (14)**	**20.3 (30)**	**33.8 (50)**	**31.8 (47)**	**2.0 (3)**	**3.8**	**1.1**
Help in incorporating computers into curriculum.	**2.7 (4)**	**3.4 (5)**	**8.1 (12)**	**41.2 (61)**	**43.9 (65)**	**0.7 (1)**	**4.2**	**0.9**

Note. Numbers in brackets denote frequencies of responses

1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree; and

No Ans= No Answer.

[a]n = 148

Hardware and Technical Support Required by Teachers

Table 4.20 summarized the results of teachers' responses concerning their requirement for access to hardware and technical support. Eighty four percent of the teachers strongly agreed (24% agreed; 60% strongly agreed) that in order to increase the use of computer technology in the classroom, they need access to hardware for themselves.

Table 4.20. Access to Hardware and Technical Support

Survey Question *	SD 1 %	D 2 %	UD 3 %	A 4 %	SA %	No Ans	Mean	sd
In order for me to increase the use of computer technology with students, I require ...								
Access to up-to-date computers for myself.	4.7 (7)	5.4 (8)	4.1 (6)	24.3 (36)	60.1 (89)	1.4 (2)	4.3	1.1
Access to up –to-date computers for my students.	2.0 (3)	6.8 (10)	3.4 (5)	33.1 (49)	54.1 (80)	0.7 (1)	4.3	1.0
Someone in the school to help in the maintenance of the networking of computers.	3.4 (5)	2.7 (4)	8.8 (13)	20.3 (30)	60.8 (90)	4.1 (6)	4.4	1.0
Access to timely technical and on-site help.	1.4 (2)	4.7 (7)	8.1 (12)	31.1 (46)	51.4 (76)	3.4 (5)	4.3	0.9

Note. Numbers in brackets denote frequencies of responses

1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree; and No Ans= No Answer.

***n = 148**

Table 4.20 shows that 87% of the respondents strongly agreed (33% agreed; 54% strongly agreed) that in order to increase the use of computer technology in the classroom, they need access to hardware for their students. Eighty one percent of the teachers agreed or strongly agreed (20%; 61%) that they require someone in the school to help in the maintenance of the networking of computers. Eighty two percent of the teachers agreed or strongly agreed (31%; 51%) that they require access to timely technical and on-site help.

Table 4.21 Strategies for Integrating Computer Technology With Curriculum

Survey Question [a]	SD 1 %	D 2 %	UD 3 %	A 4 %	SA %	No Ans	Mean	sd
I require Training in the use of strategies for the reorganization of my class for integrating computers in the classroom or the computer lab.	2.0 (3)	4.1 (6)	12.2 (18)	42.6 (63)	37.8 (56)	1.4 (2)	4.1	0.9
I require Training in the use of strategies, activities or approaches in teaching that will help me integrate computer technology into the curriculum.	2.0 (3)	2.0 (3)	6.1 (9)	49.3 (73)	39.2 (58)	1.4 (2)	4.2	0.8

Note. Numbers in brackets denote frequencies of responses
1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree; and

No Ans= No Answer.

[a]n = 148

Table 4.21 addressed the issues of teachers' requirement for training strategies in integrating computer technology with curriculum. In order for teachers to implement computer technology in the classroom, 81% of them reported that they agreed or strongly agreed that they require training in strategies for the reorganization of their classes and for integrating computer technology in the classroom or the computer lab (43% agreed; 38% agreed strongly). Eighty eight percent of the respondents agreed or strongly agreed (49% agreed; 39% strongly agreed) that they require training in teaching approaches in order to integrate computer technology into the curriculum.

School and Administrative Support Required by Teachers

Table 4.22 summarized the results of teachers' responses concerning school and administrative support. Table 4.22 shows that 55% of the teachers agreed or strongly agreed with the statement that "In order for me to increase the use of computer technology with students, I require more administrative support." (30% agreed; 25% strongly agreed).

Table 4.22. School and Administrative Support Required by Teachers

Survey Question [a]	SD 1 %	D 2 %	UD 3 %	A 4 %	SA %	No Ans	Mean	sd
In order for me to increase the use of computer technology with students, I require ...								
More administrative support.	**4.7 (7)**	**19.6 (29)**	**16.9 (25)**	**30.4 (45)**	**25.0 (37)**	**3.4 (5)**	**3.5**	**1.2**
Easier scheduling of facilities.	**2.0 (3)**	**12.8 (19)**	**17.6 (26)**	**33.1 (49)**	**31.8 (47)**	**2.7 (4)**	**3.8**	**1.0**

Note. Numbers in brackets denote frequencies of responses

1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree; and

No Ans= No Answer.

[a]n = 148

Twenty five percent of the respondents disagreed or strongly disagreed with that statement while 17% of them were undecided about it. Sixty five percent of the teachers agreed or strongly agreed (33 % agreed; 32% strongly agreed) that they require easier scheduling of facilities. Eighteen percent of the respondents were undecided about this issue.

CHAPTER V

PRESENTATION OF FINDINGS: IN-DEPTH INTERVIEW

In this chapter, qualitative data are presented from the interviews of seven teachers who participated in the TIP. The primary purpose of including the interview data for this research study was for triangulation: namely, to provide an additional perspective to the impact of the TIP on the teachers, so as to enhance the validity of the research project. A brief introduction of the interviewees will be followed by the presentation of interview data.

Overview of the Interviewees

The seven TIP participants were chosen specifically for the division in which they taught. It is hoped that this method of selection will shed light into the possible concerns TIP teachers might experience within the different divisions they taught. To ensure the anonymity of the interviewees, pseudonyms were used. The pseudonyms of the seven teachers who were interviewed were Barb, Lee, Sue, Kit, Pam, Pat and Bob.

High School Teachers

Barb, a high school Science teacher, struck me as a teacher who had an extremely positive attitude towards life in general, and was very positive about the integration of computer technology in particular. ***Lee*** was also a high school teacher; she believed that programs like the Technology Incentive program (TIP) will die out because "in the future, they will only hire those who are computer literate." The major cause of dissatisfaction for Lee was that teachers were not recognized for attending the Technology Incentive Program. She suggested that teachers should be given certificates as recognition that they attended the program on their own time.

Junior High School Teachers

Sue was a junior high school teacher who was very enthusiastic about integrating computer technology to the curriculum. She suggested that technology is not only a "motivational tool" for the students, but that it is an "essential tool for teaching." ***Kit*** was a junior high school teacher who thought that computer technology is especially "empowering" for junior high school students because they had a "natural curiosity" towards using the technology.

Elementary School Teachers

Pam, Pat and Bob are elementary teachers. ***Pam*** was a Division One (Grades 1 to 3) teacher whose class has no access to the computer lab at school but she was very interested in exposing her students to the use of technology. ***Pat*** was an elementary school teacher who was very interested in integrating technology with curriculum. She incorporated the teaching of computer technology into her short term and long term plans. ***Bob*** was a Division Two (Grades 4 to 6) teacher who thought he would have the "most wonderful computer program one can imagine" if his students could have access to computers which were in reliable working-order.

Characteristics of Teachers

All interviewees were volunteer participants of the TIP. Participants of the first year of the TIP were required to spend two weeks in the summer of 1996 and at least four Saturdays during the school year of 1996-1997 to be trained in computer technology on a computer platform in which they were novice-users. Some of the interviewees had experiences with a computer platform prior to the TIP training. Both Barb, the high school teacher and Bob, the elementary teacher, had experiences with the Macintosh Platform and enrolled in the TIP for training in the Windows Platform. Pat, an elementary teacher, had extensive experiences with Apple II Es but had no experience with the Windows Platform. Sue, a junior high teacher, had limited experiences with the Windows platform and had enrolled in the TIP for training in the Macintosh Platform. Both Lee (high school teacher) and Pam (elementary teacher) had no experiences with any platform and enrolled in the Windows platform for training in the TIP. All of them displayed enthusiasm towards computer technology. Sue believed that the Internet had great potential as an educational tool and that it was very powerful in providing information for student research projects. She viewed computer technology to be an essential learning tool for Junior high students. Pat, Sue and Kit believed that computer technology could improve student improvement. The following is an excerpt taken from an interview with Kit.

> Researcher: *So, do you think that computer technology would help towards student achievement at all?*
>
> Kit: *Yeah, I think so.*
>
> Researcher: *In what way?*
>
> Kit: *Because you're giving them another tool, the tool of expression. So, a student can't say to you. "Well, I'm not a fast writer," or "Oh, I'm not a good speller," or " I don't know how to organize this Power Point." You*

know, or "I'm not a good drawer." You have graphics. You are empowering them.

Researcher: *So there's no more excuses.*

Kit: *No more excuses. There are so many things and it just says, " You are not a little person in a little room with one window. You have the universe at your disposal. And truly, Internet, you get the universe. And also, not only that, so let's talk about Internet. Fantastic, what a lovely ability to teach them discernment. Trash, fact, opinion. Racism, stereo-typing, garbage. Quality. I love the sites that have information CNN or whatever, and even there, you can show them that, here's what's presented on television. Let's look at all the stuff they couldn't include because of the sound bytes or the way they presented it to be sensational, to keep the viewer'' attention. Beautifully!*

Researcher: *You think that that is a really good, excellent tool.*

Kit: *Yes, I do. I do.*

Researcher: *And because of the fact that you think that it's accountable, then it should improve their achievement. That's a good point.*

Pat explained how she thought computer technology could be used to improve student improvement.

Researcher: *How would technology help you with student improvement?*

Pat: *Well, I think if your children have better information, more up-to-date information and they have better research strategies, they get more excited about the learning. They will do ten times more on a project I assign where*

> *they are using the computer and they are allowed to use the Internet. And I can direct them to some sites and they will go back to validate information in the books. They will go over the complete assignment several times . . . . And I think technology motivates them that way, because it looks so professional. You can catch quickly, the errors in thinking.*

Reasons for Getting Into Technology Incentive Program

All interviewees got into the program primarily because they wanted to learn about the platform they were not familiar with. They all had different reasons as to why they wanted to want to learn about the new platform. Barb wanted to participate in the TIP because firstly, she wanted to be "able to be completely knowledgeable about the IBM system." Secondly, she felt that, since the schools were buying more and more IBM's, she wanted to keep herself current with computer technology. Lastly, she wanted to "show leadership" in using computers. Lee wanted to learn about the new Windows' platform so she could learn how to use the computers in her classroom and to learn about software applications on the new platform. Sue had to learn about the Macintosh platform since the school was setting up a new Macintosh lab. Kit had to learn to use the new Windows Lab at her junior high school. Pat had to learn to use various IBM compatible machines in the computer lab as she was only familiar with the Macintosh platform. Pam and Bob wanted to learn about the windows platform because they thought schools would be adopting the Windows' platform in the long run.

General Impact of TIP Training

Barb thought she "really benefited" from the TIP and that the TIP "had been extremely beneficial." She found that the course was "just a stepping stone" for her. She believed that the course had "opened up a whole new area . . . that [she] didn't know about before taking it."

With regard to the impact of the Technology Incentive Program, Barb thought the program gave her a "basic understanding" of computer technology. She remarked, "I have a basic understanding. That's what I got from TIP. And I believe that I wouldn't have the basic understanding, had I not taken the program."

For Lee, the TIP influenced her into exploring new areas in computer technology for her personal interest,

> Lee: *What I decided to do was, I decided to take some courses on my own. I decided to take one course. I decided I like this Excel . . .*
>
> Researcher: *Would you then say that you would not have done that, go further with Excel, if you had not done TIP or would you have done it anyways?*
>
> Lee: *No, if I hadn't taken the TIP, I wouldn't have had enough knowledge to know that there was such a program as Excel in the first place . . . . But because I had taken TIP, I knew that Excel existed and I knew that Excel can do a lot of things that I'm personally interested in. You see, there is a personal interest there.*

Sue is now teaching computer courses to her students, she said that she would not have done that, had it not been for the training she received from the TIP.

She remarked, "I didn't teach computers until after the TIP programming. I think definitely it had an impact there." Kit thought that the main impact the TIP had on her was giving her a "can-do" attitude with regard to the use of computers. When asked about what the TIP did for her, she explained,

> *Of course, it gave me knowledge, that's the first thing. But I would really say that it was the attitude. It was a can-do attitude. OK, sure, I don't know everything, but I felt I had enough of a base line that I could do better and could learn.*

Pam related that the main impact of the TIP on her was the change of attitude towards computer technology. She commented,

> *As I said, four or five years ago, I, didn't know anything about computers, whether it was difficult. And now, I can see all sorts of applications for it and I feel like it is a new area to explore, and I see how it can apply to, you know, how it is going to change teaching in the future.*

The major impact of the TIP on Pat was helping her overcome some of the "mental blocks" she had, in the understanding of computer usage, in a platform which was new to her. She said,

> *I was very happy to have the TIP program because it broke through some of those blocks in my understanding . . . . It helped me break through a lot of mental blocks. It helped me, not in terms of integrating technology, but in terms of using another platform.*

Bob thought that the program helped him understand the world of personal computers [PC]. He explained, "And I suppose . . . , taking this program, it gave me that real clear foundation of the PC world."

Impact of the Summer Session (Suitability of Time)

All participants, without exception, found the Summer session to be extremely useful. Both Pat and Bob found the summer sessions to be excellent. Sue liked the fact that the summer was used for the training sessions; she explained, "I really liked the fact that it was in the summer. And I could concentrate on it for a full day, rather than having to go after school and having other commitments and being pulled another direction." Pam also found the summer time to be a good time for training, she concluded, "I didn't mind giving up the two weeks of my summer to do that. It really was quite a novel way of doing it. And I think, being in this intense, kind of learning, really was beneficial." At the beginning of the summer session, Barb had questions and reservations. She thought to herself, "Ah, two weeks of summer devoted to this course, am I going to benefit from it?" She finished that course "with complete up-beat feeling of accomplishment."

Although Lee raised a number of objections to the Saturday sessions, she did not object to the summer training sessions. Kit was the only interviewee who resented the fact that she had to use her own time to take the training.

Impact of Summer Session (The Training Program)

Barb remarked that the summer session was "very beneficial," she had a "very good memory of the experience because it was a very positive experience." Lee thought that overall, the summer sessions were well organized but there could have been a slight improvement in group-size, Lee remarked, " I think they set up the training in the first two weeks, the initial training, I think they set it up quite well. Maybe we could have had a smaller classroom. We could have done it that way, if they could have managed." Kit, Barb, and Pam liked the fact that they were taught how to set up the computer at the beginning of the summer training session. In the following conversation, Kit talks to the researcher about the summer training program.

> Researcher: *So did you remember some of the things that you really liked by way of content? During those two weeks?*
>
> Kit: *Well, I think it was set up step by step so I really really liked the way we came and actually physically had to unload the computer boxes. That was very helpful because it kind of got rid of the fear. I liked unloading it because it kind of got rid of that fear because I was a total novice. So, actually handling it and seeing that yes, we can put this together, there was a logic and step by step. That physical handling was a very good idea.*

Bob thought that the summer training program was outstanding. He expounded,

> *For me, the initiative program was wonderful because I did have that framework and it was a total learning experience, an enjoyable learning experience... with the Incentive Program, it was very comprehensive. It was very structured. And I began from the start with all the aspects covered. There were no holes on my learning curve at that time.*

Pat felt that the TIP helped her overcome the fear of learning the Windows platform, she stated,

> *But I'm finding now that when I do courses, a lot of them in the district and at the University are still on the Mac platform. So I find that I'm in this particular world that I would never have had the courage to enter, going between platforms, if I wouldn't have done TIP, the TIP program . . . . Because in our school what we had before that point, were 486's. We had just bought 486's, with Windows 3.1. I thought I would have to learn to go into DOS and do some programming. And I started to learn some of that. But going on the Pentiums, just totally side-stepped DOS and went into a more Mac-like platform, which probably was the biggest step in overcoming my fear of that platform. But yes, having a lot of software and realizing there were great similarities between the software also helped a lot. And they took us through a lot of software in that week!*

The Summer Session (The Instructors and the Instruction)

All interviewees, with the exception of Kit, thought that the instructors who conducted the summer workshops ranged from very good to excellent. Sue commented, "I really like the fact that the instructor was knowledgeable, yet human. She understood that people came from various levels of technological expertise." Bob explained why he thought the instruction of the summer session was remarkable,

> *I had a fair amount of Mac experience prior to and no experience in the Windows' world. So the transition that went through there. One of the things I greatly appreciated about the program is that it was taught in a training fashion. The gentleman that taught the course was not a teacher per se, . . .*

and it was a good quality training program. We weren't always tied into the application. I mean, the thing that was good about it was we learned very quickly how everything functions and how to use it. The applications, we, as teachers, we can apply later."

Kit was the only one who had reservations about the instructors, she said,

> *Because my sessions had different professors. It wasn't like everybody's. Many of them got one professor that stuck through the two weeks. I didn't have that, because people are on holidays and it was session x. . . . So every time I had a professor, I thought that person, the instructor was the best. And then as I got a new one, I thought, no, no, that person was the best. And then by the time I got the Internet person, I realized that that person was absolutely lousy for doing Internet.*

Impact of TIP Training-the Saturday Sessions

The Saturday sessions were mandated as part of the requirement of the TIP. Teachers were required to attend at least four days (on Saturdays) of their own time for training. The purpose of the Saturday sessions was to help teachers in the implementation of computer technology with curriculum. Participants of the TIP were permitted to attend up to eleven days of training, should they wish to do so.

All interviewees, with the exception of Barb and Pam, found the Saturday sessions to be unsatisfactory for various reasons. Lee cited the following reasons for thinking that the Saturday sessions were a waste of time: (a) poor instruction: instructors (for the Saturday sessions) were not knowledgeable, it was a case of the "blind leading the blind;" (b) teachers were required to go to the Saturday sessions;

they were not given an option not to go; teachers needed to relax on their own time rather than attending sessions where they were forced to learn something that was useless to them; (c) teachers were not interested in what the instructors were trying to teach and had no clues as to what instructors were trying to teach. Teachers did not gain practical value for the Saturday sessions; (d) instructions did not match individual teacher's interests. (e) inconsistency of the sessions; some sessions were good, others were a "waste of time." (f) poor organization, e.g. confusion occurs when there were changes of location. Bob, when asked what he thought about the Saturday sessions, remarked,

> *I found them a total disaster. An absolute and complete utter disaster. They were disorganized, they were of little benefit. I went to the one about the Language Arts, what not, totally wasting my days saying, '"Now we're in the writing process, these three parts, the pre-writing, the writing and . . . "' I don't think so. I mean, that was just absolute waste of time. And I think that was general consensus. In most of the sessions that I was in there was a great number of people who didn't show up or left by noon . . . . The concept was wonderful but it was the people, I guess that were involved, didn't have the skills or the organization or the ability to make it worthwhile and useful. It was totally chaotic.*

Pam reiterated the same sentiment,

Pam: . . . *It was disorganized. I felt like I was wasting my valuable weekends. I was really disappointed. I thought that they could have been* *much better. I thought I would come back with some hands-on things to use in the classroom. And, I didn't.*

Researcher: *So the teaching application part wasn't that useful in any way.*

Pam: *No.*

Sue was not critical of the training of the Saturday sessions per se, she just found it difficult to attend sessions on Saturdays when she had so many commitments during the school year that she had to attend to. Barb and Pat had no problems with the sessions. Barb thought that the Saturday courses were "extremely beneficial." Pat, in fact, had attended ten Saturday sessions and had found them useful. Pat made the following comments about the instructors of the Saturday sessions,

> *I realized a very interesting factor about learning and teaching. I realized that some of the instructors really had a gift and the courage to try things. They may not have been, but if I interpret them as overly critical, I would immediately panic, I would think "Oh, I can't do this. " And if they would say "Oh, this is wonderful, you can do this" And they'd come up very quietly and encouragingly, I would try the most difficult things, like spreadsheets.*

Perceived Impact of Computers On Loan for 1996-1997

Barb was surprised at the quality and the amount of hardware she received, of which she remarked, " It was the Cadillac system of the time. So I didn't just receive a computer, to work with. It had all the bells and whistles on it, of the time. And it was the most current."

Since participants of the TIP were given the use of the computer on loan for a year, I asked Barb how significant that component of the TIP program was to her. Her reply was , "Very significant. Yes. Very significant." She took the computer home at the end of the two week summer-training period. She learned how to set up the computer from the TIP. After the summer session, she had set up the computer at home by herself and had practiced some of the things she had learned during the whole school year.

In her explanation of why she bought the TIP computer after she completed the program, Barb concluded that, having the computer on loan to her for one year gave her the time she needed to make the decision to purchase the computer.

> *I bought the computer, after the year was over, through the district. We have the option to buy the computer the first year. But it was not cheap. We're not getting a special deal on it . . . I had it in the back of my mind for a year there. You know what am I going to do. Am I going to buy this computer or am I going to let the school have it back at the end of the year. And we got used to using it at home in a room where it is very very usable. It's been on-line. It's been hooked up onto the Internet. It would cost me a lot to change everything. To get all the programs on that I had on it. I didn't want to waste my time. So I spent the money, my hard-earned money on paying on the computer. But I am very happy I did.*

Sue thought that the computer-on loan was the best part of the TIP. She acknowledged,

> *To me the best part was having the use of that computer for a year. Because not only did it help me, because we have Macs at school. It helped me get into projects and learned things that I wouldn't have time to learn at work, because of other pressures and commitment. To me that was just excellent.*

Pat appreciated that the "district had entrusted her with a computer." She found it to be a "great advantage to have the computer at home" so that she had the option of working "at three in the morning in [her] own house." She also related that, having the computer-on loan made her realize that she needed to have access to an up-to-date computer at home. She immediately purchased a computer after the TIP.

Pam took the computer home but found that she did not use it much at home. She usually finished most of her daily work at school and did not have to use the computer to do work at home. Her school purchased the TIP computer after the first year of the TIP was completed. She had the use of the TIP computer and printer in her classroom; she found that to be extremely valuable for making plans related to teaching.

Kit did not talk about how she used the computer-on loan to her, she mentioned that her husband helped her set it up at home. Bob took the computer home until Christmas time. He took it back to school after Christmas since he found it more useful to have the computer at school. He explained, "What helped immensely was having a computer on my desk as a teacher. So that I can multi-task. I need something done, it's done immediately. There's a printer there, it's there. That revolutionized my teaching ability immensely."

Perceived Changes in Skill and Knowledge in Using Computer Technology

Barb described what she was able to do after having taken the TIP,

> *I came to school, I had a classroom. I had a computer in my classroom, just like it (the TIP computer) to work with, so as a result I was able to do a lot of the things that I learned during that period of time, in my class, for my own self, processing the materials but also for instruction in my classroom. I have been fortunate, I have had the computer all the time since I took that program. I have my computer actually hooked up to my monitor. I can learn programs, I can pull things off the Internet, for my classroom. And I can show that to my students. It has been extremely beneficial to have learned those skills in that program, that two week course, and those Saturday courses that we took. I can do a lot of things I never knew before I took the program in (summer of 1996).*

Sue was able to apply what she had learned from the TIP towards teaching,

> *I didn't teach computers until after the TIP programming. I think definitely it had an impact there. For Social Studies, it definitely had an impact there. As far as Claris Draw and Claris Paint, there is lots of fun to be had there. I have used it in the computer class a lot.*

Pat had gone on from the TIP to work with multi-media in integrating technology with curriculum. For Bob, the TIP gave him a good foundation to move forward with confidence, as he indicated with these words, "But to me it [TIP training] was a good comprehensive foundation. It wasn't, say, with the Mac world, it was all piece meal with holes here and there [prior to TIP training]. It [TIP] gives me a good strong basis. It gave me a sense of confidence."

Pam really enjoys working with the computer as a result of training from the TIP. She commented,

> Pam: *For me, it really got me going on computers.*
>
> Researcher: *So it's almost everything else now, this point forward, the impetus was from TIP.*
>
> Pam: *Yes. For me it was. I would say that it really was. It kind of got me going and now I really enjoy it.*

Kit acknowledged that there was a lot to be learned but she felt she had a handle on it. She said, "OK, sure, I don't know everything, but I felt I had enough of a base line that I could do better and could learn." Lee mainly used word-processing to communicate with colleagues related to teaching. She thought she was more aware of different uses of computer after the TIP,

> Researcher: *So in other words, I hear you say that, after TIP, you're more aware of the different uses of different aspects of computer technology. Would that be fair to say that?*
>
> Lee: *I think that probably would be correct. That I am more aware. I mean, I knew lots of things were possible before hand, just as a sort of an idea in my head. But I've actually seen. So I have a more concrete realization.*
>
> Researcher: *So you can be more critical.*

Lee: *Oh, yeah!* (laughter). *I am able to evaluate it. In other words, I am more informed. Oh yeah, I'm more informed alright!*

Perceived Change of Attitude Towards Computer Technology

The theme of gaining more confidence from having taken the TIP training was reiterated by all those who expressed they had fear of computer prior to the TIP.

Kit and Pam both said that the TIP helped them overcome the fear of computer technology. Not only did Pam overcome her fear of using computers, she now "loves her computer."

Researcher: *So you're more comfortable with it (computer).*

Pam: *Oh. I love my computer. I do.*

Kit revealed how the TIP changed her attitude towards the computer,

Researcher: *So, did TIP help you in any way change your attitude towards the computer?*

Kit: *I wasn't afraid.*

Researcher: *So were you afraid then?*

Kit: *Yes, I was really afraid.*

Pat overcame the fear of Windows platform after she took the TIP training. Sue also felt that she was more comfortable with computer technology. The TIP had change Sue's attitude, it had made her more aware of the potential of using computer for teaching. Lee, was asked if she felt more favourable towards computer technology. She thought that prior to the TIP, she had thought that word processing was great. But after the TIP, she went beyond word-processing. She commented, "Getting beyond word processing. I could see where I would love kids to understand how Excel worked because I would like them, to be able to use that in conjunction with the knowledge of statistics."

Bob thought the TIP gave him "a very strong foundation from which to build and cause an evolution of wanting to move forward, do different things." Barb was very enthusiastic about the use of technology for teaching. Although Barb already believed in the potential of computer technology as a tool for teaching, the Technology Incentive Program has widened her horizons and as a result of the training, she felt empowered to integrate computer technology with the curriculum in a much more confident way.

Integration or Implementation of Computer Technology With Curriculum

Barb, Pat, Pam , Bob and Sue were integrating technology with curriculum in different degrees. Barb used CD ROM to integrate computer technology with curriculum. She gave an example of how she could get the students ready to do a "heart dissection," using a Module from the CD ROM. Students could view the heart from the CD ROM at different angles, e.g., the side view, back view or the "internal view, deeply cut away." In addition to that, at the end of the CD ROM lesson, a quiz was provided under each topic so students could test themselves to see if they had grasped the concepts taught for the topic. Barb explained,

> *Yeah, and I can come back to it at any point you know, say, we're having difficulty. We don't know what we're looking for in the heart, we can do a different side view, the back view, because they are going to look at the heart at different angles. Oh , it's great!*

Sue used CD ROM's to develop lesson plans for teaching Math, Language Arts and Social Studies. She found sites on the Internet for Social Studies and used them for teaching in the classroom. She also shared the sites she found on the Internet with her colleagues. She taught her students to use Power Point for presentation of reports and projects. Although Kit believed the Internet to be a great tool for teaching and learning, her students did not have access to computers at the time of the interview, since the computer lab at her school had just been set up, almost a year after she took training from the TIP.

Pam related how she used CD ROM to integrate technology with the Social Studies Curriculum,

> *Recently I've got a presentation system in the room, so I've been trying to use it for teaching from using the CD ROM, to Encarta to, we're studying Japan, so bring up the Japan and show them the volcano and things like that. That's only been in the last couple of weeks. But having that in the room had really encouraged me to try and integrate the use of the computer into my teaching.*

Bob stressed that he would have the most wonderful computer program if the computers were all in working order in his school. He lamented,

> *As experience teacher, I have a wealth of applications and for me, I have a need and I look for technology to help me meet that need as opposed to, here is a technology now, what am I going to use it for? The problem being is, it's not functional. If I've got 30 students and I have got one Internet station for them to use, it's really inadequate.*

Lee was not implementing computer with curriculum, she explained, "I just want to tell you. Quite frankly, I doubt that I will ever be using Power Point in the classroom because I am going to be retiring. I've got the way that I would like to do things." Lee used the computer solely for planning and administration purposes.

Reasons for Failure of Integration of Technology With Curriculum

Teachers gave the following insights when asked why they thought the majority of teachers were not integrating of technology with curriculum:

Some teachers have no intentions of using computer technology for teaching and learning, Lee commented,

> *I just want to tell you. Quite frankly, I doubt that I will [illegible] be using Power Point in the classroom because I am going to be retiring. I've got the way that I would like to do things. And I could see that everybody is going to go, I don't think everybody is going to.*

Bob thought that some teachers just want technology for "show" in their classroom, they do not make use of the technology being available to them. He remarked,

> *We have a lot of cases where, people want to have computers sitting in their classroom so that parents walk in and it looks good. Whether it's being used or not, it's irrelevant. I think that is a big issue.*

Pam thought the using technology in the classroom involves a lot of work on the part of the teachers and teachers need the time to plan for integration of technology with curriculum. She explained,

> *I'm thinking that if somebody said, you can have thirty computers for each student, I would be delighted but it would be a lot of work. And I think, we being teachers, are certainly not afraid of work. But you know, people, I think, they need time off. I mean, consultants have time to prepare an afternoon session. They have whatever two, three days. We need time. You know, we've got the little bodies there, 30 of them there and to try and implement the technology, it's a lot of work. So I would love the challenge but boy, we need some time.*

Bob explained that one of the reasons why integration of technology with curriculum is not happening is because ". . . there is a miss-match of people, the ones [teachers] that can do it, they don't get it [access to computers]. The ones that can't do it, get it [access to computers]."

Pat and Bob remarked that teachers require access to up to date computers for their students. Both of them have problems of having to struggle with computer labs with out of date and non-functional computers.

Bob believes that the use of technology in teaching requires a different framework on both the teachers and the students. He thinks that teachers should try to be facilitators and students should get used to being more independent and should try to use thinking skills for solving problems.

Bob thought that it is difficult for teachers to accommodate and provide individual instruction for a class of students with different range of computer experiences and expertise. He commented,

> *I think the other thing too is, where you have a lack of sequence and scope in a school, it's very difficult to take a class in there, when you have got half the class who have a lot of experience with computers because the previous teachers have done a lot of computers with them and the other class who have no computer experience because the teachers don't believe in computers. And you got that miss-match.*

Bob thought that the priority of students needs for functional and up-to-date computer system has not been recognized as one the most important priority in the district and in the local school. Maintenance of office computers often have more priority than maintenance of computers used by students. He claimed that teachers do not have immediate access to technical help for network or hardware problems.

Sue thought that Teachers should be trained to use both platforms. Teachers could encounter difficulties in integrating technology with curriculum when they transfer to a school with computer platforms that they are unfamiliar with. She remarked,

> *I was wishing that there had been a day in the TIP's program ... that, we were given a day to try the other environment, and Windows and understand. Because I've been in this school for a few years, but who is to say that my next school isn't a Window's environment? And then what, you know?*

Pat thought that one of the barriers to integrating technology with curriculum is that there is generally not enough memory or storage space in the computer hard drive for students to save the multimedia projects they wish to complete.

Perceived Change of Teaching Approaches, Strategies, and Organization

As a result of the training from the TIP, Barb is comfortable in teaching students how to do research on-line and to use Power Point in making presentations. Barb remarked that she would not have taken this approach, had she never taken the TIP.

> Barb: *I had one class do research projects completely on line on the World Wide Web. I hadn't done that before. And this requires that I actually take the class to the Lab. . . . So I took the students down there. They did their research on-line there and they have to present their presentation as Power Point presentations. So they did that all on their own on computers.*
>
> Researcher: *Would you have done that, had you not taken TIP?*
>
> Barb: *No, because I had no familiarity with Power Point. I knew people that were using Power Point. But I never used it myself.*

Teachers, like Barb, Bob and Pat, who engaged their students in the use of technology in the classroom, found that they had to change or adjust their approach when they tried to integrate technology with curriculum. Bob acknowledged that the "project approach" needed to be adopted when students are engaged with learning the curriculum with the help of computer technology. He explained,

> Researcher: *So, what kind of teaching approach, strategies, organization, you think, have to be changed before computers could be implemented. Or do you think there is a need for reorganization, or teaching strategies at all?*

Bob: *I think it depends on what you are using it for. If it's just regurgitation or word processing, there is not much there. But if you want the kids to actually do some development in concepts and all that sort of stuff, you have to do more of a project approach to teaching and allow them to experiment and allow them to think through to do the planning and whatnot as opposed to always teacher-directed. And I find that even in Division Two, so many of my kids, I call it full of mommy syndrome. I mean, right away it's hands up, "I need help, I need help, I need help." "Well, why don't you try!" " Oh no, Susanne will probably come to my rescue." And that whole sense of exploration-learning, discovery-learning needs to be there to make it happen properly.*

Researcher: *So with that, it would come, may be organizational change. Right, because if you're doing that kind of approach, you can't have them just sit down and listen. They would have to be exploring, like you said.*

Bob: *The teacher becomes a facilitator.*

Lee, Kit and Pam (whose students, for a variety of reasons, were not using technology in the classroom at the time of the interview) did not experience any necessity for change of approach in implementing technology with curriculum. Lee was not using technology for teaching curriculum. Kit had intentions of using the Internet as a tool for integrating technology with curriculum but she did not have a chance to try it yet since the computer lab in her school had not been set up until three weeks before the interview. Pam used CD ROM to teach her students but her Division One students did not have access to the computer lab since there were not enough computers in the school. Since Sue had never taught computers until after she had taken her training from the TIP, all the approaches she is using at present would be different from what she had been using previously when she was not teaching computers.

Factors Other Than TIP Which Influenced Computer Usage

When asked what factors, other than the TIP, influenced their usage of computer, the majority of the interviewees cited the use of computer for planning and for electronic mail to be the main reasons for using the computer. Bob, Pam and Sue also mentioned that they used the Internet as a resource for teaching and for professional development.

Factors which enhance usage.

One factor which enhances the usage of computer for Barb was the sharing of information with her colleagues. She found her colleagues to be "very curricula oriented." She remarked, "They are developing things in their classrooms that are new to me. And I am wanting to learn about these, these sort of projects that they are using in their classrooms."

Barriers to Computer Usage

Bob mentioned that he could not implement technology in his Division Two classroom if he were not provided with the equipment. He lamented the lack of support when the equipment breaks down,

> Researcher: *So if you were given the equipment that would work, that would solve most of your problems you're seeing, right?*
>
> Bob: *Give me the equipment and allow me to do it. Yeah, give it to me. And here is something to be said too about ownership of equipment as well. When*

someone is in there who does not know what they're doing and mess things up, I have to go back in and fix everything.

Researcher: *So ideally, you should have your own computers in your own class where you're doing computers with project approach. And if they're not doing computers, you're doing something else, then somebody else would just use it. It's almost like an on-going thing. You don't have to go to a special place to have computers.*

Bob: *However, the best thing that happens for me is when each kid has his own computer. I know a lot of others are talking about ,you know these people are working in grids and all sorts of stuff. Well, that doesn't lead to any accountability. If you want those children to learn those thinking skills or whatever. It's best to have their own computers, their own work station and they're actually producing and thinking and doing things.*

Bob was "weary of fighting a loosing battle" since support for the maintenance of equipment did not seem to be given as priority.

Bob: *I think one of the other difficulties in terms of integration is if something needs to be fixed or something needs to be added to a computer in a classroom. It's sort of viewed as, it's not all that is essential. Whereas if the slightest twitch happens to the computer in the office, there is someone immediately here to fix it and see what happens. I mean, we wait, months and months and months to have, I guess, simplest things done.*

Researcher: *So you need actually more support, that I can hear.*

Bob: *And support through a realization that this is essential part of what we are doing.*

Sue did not see any barriers in computer usage for her junior high students. The students in her school had access to computers and there was no scheduling problems for the use of computer labs. She mentioned that since she only had training from the TIP on the Mac platform, she would like to have the opportunity to have training in the Windows' platform in case one day she had to be teaching in a school with that platform.

Kit mentioned that 'time' was her major barrier to using the computer, she resented having to spend time using the computer for doing clerical jobs which were done previously by secretaries before she had her computer training.

Researcher: *So what do you think are the obstacles to computer usage, in your situation now? For both you and your students?*

Kit: *I think for me, time. I just don't like this downloading of expectations. So secretarial, blah, blah, blah, garbage. We're all down loaded onto IEP's [Individual Educational Plan] with computers, I mean, what someone else used to do, now I'm doing. And I think that that is really unfair. The clerical, and I personally resent it.*

Pat found funding to be one of the major barriers. She commented,

I guess I am limited by the barriers that are around me. If the school can't afford to represent the priority of the district and the province to integrate technology, I am limited in what I can do. Because I can only use and the children can only use what's available, and we have to be realistic.

> *Education is a very expensive endeavour. Books cost money, salaries cost money. . . We have all kinds of glitches in our lab because we don't have enough hard drive and storage space. I think our district could solve that problem. I think our district could have storage space for the schools, for example, where students could store posters or web pages and every school would have storage space on the district server.*

With regard to personal barriers, Pat remarked,

> *My personal barriers are related to the funding issues, because we can only do so much. we can only do what we have the money for. Some of my barriers are my personal challenge, learning this technology and keeping up with it.*

Pam thought that some of the barriers of using technology are: equipment, time, access, and lack of professional development opportunities, she remarked,

> *I think we need equipment. I think we need time. We need access to funding and not just P. D. [Professional Development] in the district's world; P.D. money to go into the business world and experience those kinds of things. We need intervisitations and we need to be informed communication teachers. Classroom teachers need to find out about what's happening. We don't know what's happening. It never gets to us, like . . . , that initiative, . . . they were giving teachers equipment so that they could use in their room. We don't find out. If we do find out, it's probably the deadline is over.*

Barb found one of the barriers to using computer technology to be not having enough time to "explore the software and materials out there in the market." She remarked,

> *The barrier is getting the time to explore the use of the software in the classroom. To actually develop a lesson plan that uses that particular software, in your classroom, in whatever fashion you're going to use it. That's sort of always have been the barrier. The time to do that. And the only time I've ever gotten through that barrier, is to just actually use it in the classroom and to experiment it with my student.*

Referring to barriers in using technology, Lee stated, "The only barriers are those created by my mind at learning."

Accessibility of Computers

With regard to the accessibility of computers for the schools in which the interviewees worked, it seemed that the high school and junior high school teachers had no major problems providing access to computers for their students. Access for these students was provided through computer labs. However, the situation was quite the opposite for elementary students. Pam's Division One students did not have access to computers at all, since there were not enough computers to share between all the students in her school. Pat's elementary school did not have up-to-date computers to work with. The students in Pat's school work with an assortment of old and new IBM compatibles and Macintosh machines. The situation of mixed platforms and out of date machines made it difficult for teachers to implement technology with curriculum. Bob's elementary school had a computer lab but it was frequently non-functional for long stretches of time, sometimes for a few months. He could not counting on having it functioning for the implementation of technology when he needed it. The computer lab at Bob's school is also inadequately since there were very few computers connected to the Internet.

Other Comments on TIP

Besides the above themes, the interviewees made additional comments about the TIP. Details of those comments are presented below:

Positive comments. Pat thought that "The thing about TIP that is exciting is that because it is a district initiative, it's very focused on curriculum and on student achievement." Since there were many highly skilled instructors in the training sessions she attended, Pat learned "the power of a teacher" by becoming a student when she took her TIP training.

Improvement on facilities and program needed. Kit thought that the TIP should provide more comfortable chairs for the participants for their two week summer sessions. Below were some of her suggestions,

> *They needed to think more of the comfort of the people in the room. The seats were terrible. They should have rented ergonomical correct seats because by the end of the day, we all had strained necks. We were all really uncomfortable and I think that, also, if you value your people, that will be one way to show them you value them, by providing them with comfortable chairs. And it's so important even, I mean, sure, they showed us all the techniques. But also if they want to prevent carpal-tunnel syndrome, all of the various conditions that one gets from computer misuse, we should have*

> *had, as part of the course, should have been directed at that. And they should have showed that they cared about that. Because, after, shoved into those rooms, with those kinds of seats, in a way, you felt like a slave. You know, kind of a sweat-shop environment. And I think they really should have said, "You know, we value you, you are spending two weeks here, of your summer holiday. We are going to show that we value you." And I think that would have been very very nice.*

TIP computers. Kit, Pat and Barb brought up the topic of the price of the TIP computers, Kit thought that the computers should have been sold to the teachers at the same price they had been sold to the schools. She was not happy that teachers who wanted to buy the TIP computers had to pay more than what the schools had to pay for them. Pat thought that the district could have obtained a better deal for the TIP computers from the computer company in the first place. Barb had no problems with the price of the TIP computer she bought since she thought it was a good package deal, considering the software that came with the computer.

Computer Technology as an Instrument or Tool for Teaching

Both Barb and Pam thought that "technology will never replace teachers." Pat believed related her belief in the importance of technology,

> *I believe that technology is my basic responsibility; that it's one of the basic literacy. And I take it very seriously and I know that it's not an easy one for me to learn. I think this generation are born into the world to learn. They are born into a world where all the professionals will be using technology.*

Barb was adamant that her students should be exposed to computer technology. She believed that all teachers could learn to integrate computer technology with curriculum, given the time and the training. She also believed that "computer technology will not replace teachers."

Lee emphasized that technology was not automatically better in teaching students. She explained,

> *Just because someone has a television monitor and the computer and hook up the . . . line and can do something on Power Point, that their lesson is going to be better. Not necessarily! So I'm not putting down Power Point. I'm putting down the kind of thinking that says that everything is automatically better. It isn't, it's the pits, dependent on the knowledge of the person using it and how it is used. And it just tears me when I think people think technology is good, just for technology's sake. No it's the use, hello!*

Pam believed that young kids, as young as Division One students, should be using technology,

> Researcher: *Obviously, the school, I'm not trying to criticize your school, but the school has made the decision to say that young kids, younger than Division Two, it's not very important for them to have access to computers. Do you agree with that philosophy or do you want to change it or what is your framework on that?*
>
> Pam: *Well, I think that we have to move into the next millenium and I think that the business world is telling us we are on board. This is the way it's*

> *going to be. And I think we do, we have to start with the kids, you know, as soon as possible. It is, for some of them, it is part of their world.*

Support for Teachers Who Excel in the use of Computer Technology

Bob suggested that teachers who had expertise in computer training should be recognized by the district and should be encouraged to go forward without having to be dragged down by "battle fatigues" with non-functioning equipment. He put it succinctly, "Our system should be removing any road blocks that hold those people who want to move to the forefront. Remove those roadblocks, let the eagle soar!"

CHAPTER VI

PRESENTATION OF FINDINGS: SURVEY OF NON-TIP TEACHERS

This chapter presents the findings obtained from the survey of teachers who were unsuccessful in being accepted by the TIP (non-TIP teachers). The total number of usable survey was 20, which was 14% of the non-TIP teachers. In grouping data for presentation, factor analysis was not done for the non-TIP group. For the sake of consistency, the same themes used for the TIP group were also used for the non-TIP for the presentation of data, whenever it is appropriate.

Possible Reasons for Low Responses From Non-TIP Teachers

There may have been many reasons why the response rate of non-Tip teachers were so low for the survey. Some of the reasons are listed below:

1. No records could be found for the unsuccessful candidates of the TIP. Therefore the names of non-TIP teachers could not be verified, identified or located for the survey.
2. One respondent who was rejected by the first year of the TIP completed the survey for the non-TIP group. However, this respondent was later accepted by the second Year of the TIP. This respondent's completed survey had to be discarded since she was not a true non-TIP teacher. So there appeared to be a possibility that some of the non-TIP participants who were rejected in the first year of TIP might have become a participant of TIP in the second year.
3. Since the non-TIP teachers could be nominated by their principals for the Second Year of the TIP for 1997-1998, it was possible that many of the non-TIP teachers might have eventually enrolled in the second year of TIP. This could be one

of the reasons why only 20 of them took part in the survey for the purpose of this study.

4. Some teachers, even though they were rejected by the TIP, enrolled in TIP by paying tuition fee through the support of the principal. Under these circumstances, they just took the two-week summer sessions without receiving the benefit of having a computer on loan to them for one year. They were also given the option of attending the Saturday sessions if they wished. One principal wrote to inform the researcher of a teacher who was not selected for the TIP, "Catherine [researcher], we did have one teacher who did not get accepted but I sent her to the alternate session. The only difference was that she did not get the use of a computer for a year."
5. Principals were busy and did not take the time to identify the non-TIP teachers. Letters were sent to over 165 schools which participated in the TIP and only 16 principals responded and informed the researcher that all the teachers who were nominated in their schools were successful into getting into the TIP.
6. Non-TIP participants might have refused to participate in the survey due to the fact that they were not selected to participate in the TIP.
7. A lot of time has elapsed since the non-TIP teachers tried to enroll into the program in May, 1996. The names of the non-TIP teachers might have been forgotten by the principal, the school staff or the non-TIP teachers themselves. Some teachers might have been transferred, moved out of the district or on leave of absence.

The findings of 20 teachers who responded to the survey were reported below. Since the sample of non-TIP teachers was low, it cannot be assumed that the sample of the twenty teachers is representative of the non-TIP population of teachers. Therefore, the comparison of the two group of teachers, the TIP and the non-TIP teachers, was not made.

Table 6.1 shows the return rate of completed surveys based on division level and gender. Seventy five percent of the non-TIP respondents were females. Eighty five percent of the teachers were elementary teachers (50% taught in Division One and 35% in Division Two).

Table 6.1. Demographic Characteristics of Non-TIP Respondents

Sex	Frequency	Percentage of Frequency
Female	15	75
Male	5	25
Division	**Frequency**	**Percentage of Frequency**
Division 1	10	50
Division 2	7	35
Division 3	2	10
Division 4	2	10

Note. The total number of response was 20, however some teachers indicated that they teach in more than one division, therefore frequencies were in excess of 20 and percentages were in excess of 100%.

Non-TIP Teachers' Computer Related Activities

What interests were shown by non-TIP teachers, between the period of July, 1996 to March, 1998, in other computer-related activities? Table 6.2 showed percentages of teachers participating in computer related activities since July, 1998.

Table 6.2. Non-TIP Teachers' Computer Related Activities

Computer related activities attended after Since July, 1996 [a]	Yes %	No %	Missing %
Attended In-services related to computer technology	65 (13)	35 (7)	0 (0)
Read articles, journals or magazines on computer technology	35 (7)	60 (12)	5 (1)
Attended computer conference related to computer technology	20 (4)	80 (16)	0 (0)
Used microcomputer to inservice staff	35 (7)	65 (13)	0 (0)

Note. Numbers in brackets denote frequencies of responses

[a] n = 20

The results in Table 6.2 showed that 65% of the non-TIP teachers attended inservices related to computer technology and 35% of them read articles, journals or magazines since July, 1996. One fifth of them attended conferences related to computer technology since the summer of 1996 and over one third of the teachers (35%) used microcomputers to inservice staff for professional development purposes.

Perception of Level of Expertise by Non-TIP teachers

What changes were shown by non-TIP teachers, (teachers who applied for but were rejected by the TIP) between the period of July, 1996 to March, 1998 with regard to their perception of the level of knowledge and skill in computer usage?

Non-TIP teachers were asked to rate themselves, on a scale of *one to ten*, on their perceived level of expertise in computer usage, comparing the period before July, 1996 to the time of the survey, March, 1998. On the survey, the scale of *one to* *ten* was defined for teachers as follows. *One* refers to teachers who view themselves as having no knowledge and skill in computer technology; and *ten* refers to teachers who view themselves as having expert knowledge and skill in computer technology.

Table 6.3 shows results of a paired t test comparing teachers' perceived knowledge and skill in computer usage for the period before July, 1996 and March, 1998.

Table 6.3. Paired t Tests on Non-TIP Teachers' Level of Expertise

Perceived Level of Expertise by teachers [a]	Mean	sd	Df[b]	t value	2-tail sig
Knowledge and skill in computer technology prior to July 96	3.0	1.9	19	6.6	.000*
Knowledge and skill in computer technology as of today, March, 1998	5.3	2.2			

[a] n = 20 [b] df= degree of freedom

*P< .05

Results of the paired t test showed that non-TIP teachers' perception of knowledge and skill in using computers increased significantly [t (19)= 6.6, $p < .05$] over the specified times.

Non- TIP Teachers- Computer Usage for Teaching Purposes

In using computers for teaching purposes, what changes were shown by non-TIP teachers between the period of July, 1996 to March, 1998 with regard to the number of hours of computer usage? Table 6.4 shows the results of a paired t test comparing computer usage of non-TIP teachers, for teaching purposes.

Table 6.4. Non-TIP teachers' Computer Usage for Teaching Purposes

Number of Hours of Computer Usage for -Teaching Purposes [a]	Mean	sd	df[b]	t value	2-tail sig
Hours per week in using computer for teaching prior to July, 1996. [a]	2.6	3.9	19	4.32	.000*
Hours per week in using computer for teaching as of today, March, 1998. [a]	7.1	6.7			

[a] n = 20 [b] df= degree of freedom

*P<.05

Non-TIP Teachers were asked to report the number of hours they used the computer for teaching before July, 1996 and in March, 1998. The results of the paired t test in Table 6.4 showed that, in comparison to the period before July, 1996 and the time of the survey in March, 1998, non-TIP teachers reported a significant [t (19)= 4.32, $p < .05$] increase in the number of hours per week they used the computer for teaching purposes.

Non-TIP teachers- Computer Usage for Non-teaching Purposes

In using computers for purposes other than teaching, what changes were shown by non-TIP teachers, between the period of July, 1996 to March, 1998 with regard to the number of hours of computer usage? Table 6.5 shows results of a paired t test comparing Computer Use of non-TIP teachers, for purposes other than teaching.

Teachers were asked to report the number of hours they used the computer for purposes other than teaching for the period before July, 1996 and the time of the survey in March, 1998.

Table 6.5. Non-TIP teachers' Computer Usage for Non-teaching Purposes

Number of Hours of computer Usage for Non-Teaching Purposes [a]	Mean	sd	Df[b]	t value	2-tail sig
Hours per week in using computer for purposes other than teaching prior to July 96.[a]	0.8	2.2	19	1.81	0.086
Hours per week in using computer for purposes other than teaching as of today, March, 1998. [a]	2.6	5.2			

[a] n = 20 [b] df= degree of freedom

The results of the paired t test in Table 6.5 showed that, in comparison to the period before July, 1996 and the time of the survey in March, 1998 teachers *did not* report a significant increase [t (19)= 1.81, $p > .05$] in the number of hours per week they used the computer for non-teaching purposes.

Non- TIP Teachers' Attitude, Confidence and Proficiency in Computer Usage

What changes were shown by non-TIP teachers, between the period of July, 1996 to March 1998 with regard to their attitudes towards the use of computers? Table 6.6 summarized the results of teachers' attitudes in using computers between the period of July, 1996 to March, 1998.

Table 6.6. Non-TIP Teachers' Attitude, Confidence and Proficiency

Survey Questions [a]	SD 1 %	D 2 %	UD 3 %	A 4 %	SA 5 %	No Ans %	Mean	sd
I feel more confident with using a computer, compared to before 1996.	5.0 (1)	0 (0)	5.0 (1)	65.0 (13)	25.0 (5)	0 (0)	4.0	0.9
I feel more confident in using a computer for word- processing, compared to before 1996.	5.0 (1)	0 (0)	10.0 (2)	40.0 (8)	45.0 (9)	0 (0)	4.2	1.0
I feel more confident in using a computer for lesson- planning, compared to before 1996.	10.0 (2)	10.0 (2)	20.0 (4)	40.0 (8)	20.0 (4)	0 (0)	3.5	1.2
I feel more confident in using a computer for delivering instruction, compared to before 1996.	15.0 (3)	20.0 (4)	25.0 (5)	30.0 (6)	10.0 (2)	0 (0)	3.0	1.3
I have a more favorable attitude towards the use of computers in general, compared to before 1996.	5.0 (1)	5.0 (1)	25.0 (5)	50.0 (10)	15.0 (3)	0 (0)	3.7	1.0
I am using computers more at work, compared to before 1996.	5.0 (1)	5.0 (1)	0 (0)	45.0 (9)	45.0 (9)	0 (0)	4.2	1.0
I am more proficient in using computer technology, compared to before 1996.	5.0 (1)	0 (0)	10.0 (2)	45.0 (9)	35.0 (7)	5.0 (1)	4.1	1.0

Note. Numbers in brackets denote frequencies of responses

1= no increase; 2= slight increase; 3= moderate increase; 4= considerable increase; and No Ans= no answer; and DNU= do not use.

[a]n = 20

Table 6.6 shows that ninety percent of the respondents agreed or strongly agreed that compared to before 1996, they felt more confident with using a computer (65% agreed; 25% strongly agreed). Eighty five percent of the non-TIP teachers agreed or strongly agreed that they felt more confident in using a computer for word processing (40% agreed; 45% strongly agreed).

Sixty percent of the respondent agreed or strongly agreed (40% agreed; 20% strongly agreed) that they were more confident in using a computer for lesson planning. Twenty percent of the respondents disagreed with them and 20% of them were undecided about the issue. Forty percent of the respondents agreed or strongly agreed that they were confident in using a computer for delivering instruction (30% agreed; 10% strongly agreed). Thirty five percent of the teachers disagreed with them.

While Sixty five percent of the respondents felt that compared to before 1996 they had a more favorable attitude towards the use of computers in general (50% agreed; 15% strongly agreed), 25% of the teachers were undecided about this issue. Ninety percent of non-TIP teachers agreed or strongly agreed that they were using computers more at work (45% agreed; 45% strongly agreed). Eighty percent agreed or strongly agreed that they were more proficient in using computer technology (45% agreed; 35% strongly agreed).

Factors Which Influence the Use of Computers (Non-TIP)

Computer Usage: Influence of Credit Courses and Self Learning

What were some factors which influenced non-TIP teachers' usage of computers between the period of July, 1996 to March, 1998? The responses to the questions listed in Table 6.7 addressed the issue of factors which influenced the usage of computers among non-TIP teachers.

Influence of formal credit courses. Sixty percent of the teachers indicated that they *disagreed or strongly disagreed* with the statement that "I am using computers more at work as a result of having taken formal credit courses." Twenty five percent of the teachers were undecided about the issue.

Influence of self learning in using computers at work. Fifty five percent of the teachers agreed or strongly agreed with the statement that "I am using computers more as a result of factors learning on my own (reading manuals, hands-on experiences)." A quarter of them were undecided about the issue.

Table 6.7. Influences of Factors on Usage of Computers For Non-TIP Teachers

Survey Question[a]	SD 1 %	D 2 %	UD 3 %	A 4 %	SA 5 %	No Ans	Mean	sd
I am using computers more at work as a result of having taken formal credit courses.	40 (8)	20 (4)	25 (5)	10 (2)	0 (0)	5.0 (1)	2.0	1.0
I am using computers more as a result of learning on my own.	10.0 (2)	10.0 (2)	25.0 (5)	30.0 (6)	25.0 (5)	0 (0)	3.5	1.2

Note. Numbers in brackets denote frequencies of responses

1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree; and

No Ans= No Answer.

[a]n = 20

Open-ended Questions for Non-TIP Group

What were some factors which influenced non-TIP teachers' usage of computers between the period of July, 1996 to March, 1998. In order to identify the factors which influenced non-TIP teachers' usage of computers, they were asked to respond to the following open-ending questions:

(a) List the main factors which increased your usage of computers since July,1996.

(b) List the main factors which prevented you from the increased usage of computers.

Analysis of Open-ended Questions. Content analysis was used to analyze data from the open-ended questions. Non- TIP Teachers identified many factors which increased computer usage as well as factors which prevented them from the increased usage of computer technology.

Non-TIP Teachers- Factors for Increase Use of Computers

Nineteen out of 20 non-TIP teachers responded to the open-ended question about factors which influenced their increase usage of computers. Table 6.8 summarized the results of these responses. Six out of 19 respondents (32%) identified having to do report card on computers as one of the factors which increased computer usage.

Table 6.8. Factors Which Influenced Non-TIP Teachers' Usage of Computers

Main factors Which Increased Non-TIP Teachers' Usage of Computers Since July, 1996. [a]	Frequencies of Responses	% of Frequencies
Having to do report card on computers as one of the factors which increased computer usage.	6	32%
Access to computers at home	5	26%
Access to computer at work	5	26%
Professional development opportunities	4	21%
Access to computer for students	3	16%
Computer Program at school	3	16%
Increase interest in computers	2	11%

Note. Percentage exceed 100% since respondents gave more than one answer to each open-ended question.

[a]n=19

Factors Which Prevented the Increased Use of Computers

All of the non-TIP teachers (20 teachers) responded to the second open-ended question in which they listed the main factors which prevented them from the increased use of computers. Table 6.9 summarized the results of these responses. Eight out of 20 of the non-TIP teachers (40%) identified having no time as the main reason which prevented them from the increase use of computers. Six out of 20 respondents (30%) reported having no access to up-to-date computers at home as the main reason for not having increased the usage of computer. Four out of 20 respondents (20%) listed having no expertise in computer knowledge as another reason which prevented them from the increased use of computers.

Table 6.9. Barriers for Computer Usage for Non-TIP Teachers

Main Factors Which Prevented Non-TIP Teachers From The Increased Usage Of Computers. [a]	Frequencies of Responses	% of Responses
No time	8	40%
No access to up-to-date computers at home	6	30%
Having no expertise in computer knowledge	4	20%
Having no keyboard skills	2	10%
Lack of training	2	10%
No access to computers for their students	2	10%
No access to quality software	2	10%
No confidence	1	5%

Note. Percentage exceed 100% since respondents gave more than one answer to each open-ended question.

[a] n=20

Non-TIP Teachers' Opinions About the Use of Computers

What changes were shown by non-TIP teachers, between the period of July, 1996 to March, 1998 with regard to their attitudes towards the use of computers? Table 6.10 shows that 90% of the teachers agreed or strongly agreed (45% agreed; 45% strongly agreed) with the statement that "I think computer technology should be used in the classrooms for teaching and learning purposes."

Eighty five percent of the respondents *disagreed or strongly disagreed* with the statement that the use of computers for teaching is "just a fad." Eighty five percent of the respondents agreed or strongly agreed (55% agreed; 30% strongly agreed) with the statement that "using computer technology is an effective way to enhance learning."

Table 6.10. Non-TIP Teachers Opinions About the Use of Computers

Survey Question [a]	SD 1 %	D 2 %	UD 3 %	A 4 %	SA 5 %	No Ans	Mean	sd
I think computer technology should be used in the classrooms for teaching and learning purposes.	0 (0)	0 (0)	10.0 (2)	45.0 (9)	45.0 (9)	0 (0)	4.4	0.7
I feel that the use of computers for teaching is just a fad.	65 (13)	20 (4)	10 (2)	0 (0)	5.0 (1)	0 (0)	1.6	1.0
Using computer technology is an effective way to enhance learning.	0 (0)	5.0 (1)	10.0 (2)	55.0 (11)	30.0 (6)	0 (0)	4.1	0.8

Note. Numbers in brackets denote frequencies of responses

1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree; and

No Ans= No Answer.

[a]n = 20

Non-TIP Teachers' Computer Usage: At Home

Table 6.11 summarized the results of teachers' responses concerning their use of computers at home. Sixty five percent of the non-TIP teachers agreed and strongly agreed (40% agreed; 25% strongly agreed) that they were using the computer more at home, compared to before 1996. Thirty percent of the non-TIP teachers disagree (5% disagreed;25% strongly) with them on this issue.

Table 6.11. Non-TIP Teachers' Usage of Computer At Home

Survey Question [a]	SD 1 %	D 2 %	UD 3 %	A 4 %	SA 5 %	No Ans	Mean	sd
I am using computers more at home, compared to before 1996.	25 (5)	5.0 (1)	5.0 (1)	40.0 (8)	25.0 (5)	0 (0)	3.4	1.6
I am using computers more at home as a result of non-credit courses or workshops	30.0 (6)	10.0 (2)	30.0 (6)	20.0 (4)	5.0 (1)	5.0 (1)	2.6	1.3
I am using computers more at home as a result of learning from family, friends, colleagues and others.	15.0 (3)	0 (0)	15.0 (3)	45.0 (9)	20.0 (4)	5.0 (1)	3.6	1.3

Note. Numbers in brackets denote frequencies of responses

1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree; and

No Ans= No Answer.

[a] n = 20

Table 6.11 shows that while 25% of non- TIP teachers agreed or strongly agreed that they increased the use of computers at home as a result of learning form non-credit courses or workshops, forty percent of respondents disagreed with them. Thirty percentage of teachers were undecided about this issue. Sixty five percent of the respondents agreed or strongly agreed (45% agreed; 20% strongly agreed) that they were using computer more at home as a result of learning from family, friends or other people.

Non-TIP Teachers' Use of Internet and Multimedia Software

What changes were shown by non-TIP teachers, between the period of July, 1996 to March, 1998 in the usage of Internet and multimedia software? Table 6.12 showed teachers' perceived increased usage of Internet and multimedia software since July, 1996.

Table 6.12. Non-TIP Teachers' Use of Internet and Multimedia Software

Internet and Multimedia Software [a]	NI 1 %	SI 2 %	MI 3 %	CI 4 %	No Ans %	DNU %	Mean	sd
Internet	5.0 (1)	10.0 (2)	25.0 (5)	25.0 (5)	5.0 (1)	30.0 (6)	3.0	1.0
Desk Top Publishing/ Graphics	35.0 (7)	15.0 (3)	10.0 (2)	10.0 (2)	0 (0)	30.0 (6)	1.9	1.1
CD ROM	30.0 (6)	15.0 (3)	15.0 (3)	10.0 (2)	0 (0)	30.0 (6)	2.1	1.1
Audio CD	25.0 (5)	10.0 (2)	15.0 (3)	10.0 (2)	0 (0)	40.0 (8)	2.2	1.2
Clip Art/ Graphics	25.0 (5)	25.0 (5)	15.0 (3)	5.0 (1)	0 (0)	30.0 (6)	2.0	1.0

Note. Numbers in brackets denote frequencies of responses

The scale was as follows: 1= no increase; 2= slight increase;

3= moderate increase; 4= considerable increase; and No Ans= no answer;

and DNU= do not use.

[a] n = 20

Table 6.12 shows that from the ratings of the use of the Internet and multimedia software, the Internet seemed to have been rated the highest by the non-

TIP teachers. One quarter of the respondents perceived considerable increase in the use of the Internet. In general, at least over 25% of the respondents reported they did not perceive any increase in the use desk top publishing, CD ROM, audio CD and Clip Art and graphics. Overall, at least 30% of non-TIP teachers reported that they did not use the Internet or the multimedia software.

Non-TIP Teachers' Use of Computer Applications

What changes were shown by non-TIP teachers, between the period of July, 1996 to March, 1998 in the use of the transferring data between applications, spreadsheet, and data base? Table 6.13 shows teachers' perceived increased usage of computer applications since July, 1996.

Table 6.13. Non-TIP Teachers' Use of Computer Applications

Usage of Computer Applications [a]	NI 1 %	SI 2 %	MI 3 %	CI 4 %	No Ans %	DNU %	Mean	sd
Transferring data between applications	**10 (2)**	**5.0 (1)**	**10.0 (2)**	**5.0 (1)**	**0 (0)**	**70 (14)**	**2.3**	**1.2**
Spreadsheet	**15 (3)**	**20 (4)**	**10 (2)**	**10 (2)**	**0 (0)**	**45 (9)**	**2.3**	**1.1**
Data Base	**50 10**	**0 (0)**	**10 (2)**	**5.0 (1)**	**0 (0)**	**35 (7)**	**1.5**	**1.0**

Note. Numbers in brackets denote frequencies of responses

1= no increase; 2= slight increase; 3= moderate increase; 4= considerable increase;

and No Ans= no answer; and DNU= do not use.

[a]n = 20

Table 6.13 shows that over all, 70% of respondents reported that they did not use transferring data between applications. Forty five percent of the teachers did not use spreadsheets, and 35% of them did not use data bases. Half of the respondents reported no increase in the use of data base.

Non-TIP Teachers' Use of Word Processing and Integration With Content Areas

What changes were shown by non-TIP teachers, between the period of July, 1996 to March, 1998 in using word processing, and integration of computer with content area? Table 6.14 shows non-TIP teachers' perceived increased usage of word processing and integration of computer with content areas since July, 1996.

Table 6.14. Non-TIP teachers' Use of Word Processing and Integration

Training Received from TIP on Word Processing and Integration [a]	NI 1 %	SI 2 %	MI 3 %	CI 4 %	No Ans %	DNU %	Mean	sd
Word Processing	15 (3)	5.0 (1)	35.0 (7)	30.0 (6)	5.0 (1)	10.0 (2)	2.9	1.0
Integration of computer with content areas	20.0 (4)	25.0 (5)	25.0 (5)	15.0 (3)	0 (0)	15.0 (3)	2.4	1.0

Note. Numbers in brackets denote frequencies of responses

The scale was as follows: 1= no increase; 2= slight increase;

3= moderate increase; 4= considerable increase; and No Ans= no answer;

and DNU= do not use.

[a]n = 20

Table 6.14 shows that 30% of the non-TIP respondents reported considerable increase in using word processing since July, 1996 and 35% of them reported moderate increase on the same item for the specified period. Only 10% of the teachers were not using word processing during the same period. Fifteen percent of the non-TIP teachers reported considerable increase in the integration of computer with content areas while 20% of the teachers did not perceive any increase and 25% of them reported slight increase in this area.

Usage of Software for Personal Usage and Planning

Table 6.15 shows non-TIP teachers' perceived increase usage of software for personal usage and planning since July, 1996. Non-TIP Teachers did not show any considerable increase in the use of games, web page creation or participate in listserv or usenet groups since July, 1996.

Table 6.15. Non-TIP Teachers' Usage of Software

Items for Personal Use[a]	NI 1 %	SI 2 %	MI 3 %	CI 4 %	No Ans %	DNU %	Mean	SD
Games	25 (5)	15 (3)	15 (3)	5.0 (1)	0 (0)	40 (8)	2.0	1.0
Creating Web pages	15 (3)	10 (2)	0 (0)	0 (0)	0 (0)	75 (15)	1.4	0.5
Participation in Listserv or Usenet	5.0 (1)	5.0 (1)	0 (0)	0 (0)	0 (0)	90 (18)	1.5	0.7
Email Usage	5.0 (1)	10 (2)	10 (2)	35 (7)	0 (0)	40 (8)	3.3	1.1
Planning for teaching	15 (3)	15 (3)	35 (7)	20 (4)	0 (0)	15 (3)	2.7	1.0

Note. Factor analysis was not used on the data presented in this table.

Numbers in brackets denote frequencies of responses

1= no increase; 2= slight increase; 3= moderate increase; 4= considerable increase;

No Ans= no answer; and DNU= do not use

[a] n = 20

Table 6.15 shows that an overwhelming majority of the non-TIP teachers did not create web pages (75%) or participate in listserv discussion groups (90%). Thirty five percent of the teachers perceived that they have increased the use of computers for electronic mail, while 40 % of them did not use electronic mail. Twenty percent of the teachers reported having increased the use of computers for planning, 15% of them did not use computer for planning.

Non-TIP Teachers' Requirement For Increase of Computer Usage

What were the perceived needs of non-TIP teachers in order to increase computer usage with students? The following section demonstrates what non-TIP teachers report they require for the implementation of computer technology. Table 6.16 shows non-TIP teachers' perceived requirement for people support for the increase use of computer technology with their students.

People Support Required by Non-TIP Teachers

At least 30% of the teachers reported in all the categories listed in Table 6.16 that they agreed strongly that they require people support in order to increase use of computers with their students. Ninety percent of non-TIP teachers agreed or strongly agreed (20% agreed; 70% strongly agreed) that in order to increase the use of computer technology with students they require support for time to acquire computer skills and to learn about computer usage.

Table 6.16. People Support Required by Non-TIP Teachers

Survey Questions [a]	SD 1 %	D 2 %	UD 3 %	A 4 %	SA 5 %	No Ans	Mean	sd
In order for me to increase the use of computer technology with students, I require ...								
Assistance in the school from other teachers.	5.0 (1)	5.0 (1)	15.0 (3)	45.0 (9)	30.0 (6)	0 (0)	3.9	1.1
Opportunities to work with colleagues as a team.	0 (0)	0 (0)	15.0 (3)	50.0 (10)	30.0 (6)	5.0 (1)	4.2	0.7
Help in the form of hands-on training.	0 (0)	5.0 (1)	5.0 (1)	45.0 (9)	45.0 (9)	0 (0)	4.3	0.8
Being shown how to use computers.	0 0)	15.0 (3)	10.0 (2)	30.0 (6)	45.0 (9)	0 (0)	4.1	1.1
Continuous training in use of computers to gain confidence in usage.	0 (0)	0 (0)	15.0 (3)	25.0 (5)	60.0 (12)	0 (0)	4.5	0.8
Time to acquire computer skills and to learn about computer usage.	0 (0)	0 (0)	0 (0)	20.0 (4)	70.0 (14)	10.0 (2)	4.8	0.4

Note. **Numbers in brackets denote frequencies of responses**

1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree; and No Ans= No Answer.

[a] n = 20

Application of Technology Required by Non-TIP Teachers

Table 6.17 summarized the results of non-TIP teachers requirement for the support for the application of computer technology in the classroom. Ninety percent of the teachers agreed or strongly agreed (35% agreed; 55% strongly agreed) that in order to increase the use of computer technology with students they require more curriculum-specific software.

Fifty five percent of the teachers agreed or strongly agreed that they require access to class sets of software and 40% percent of them were undecided about this issue. Fifty five percent of the teachers agreed or strongly agreed (35% agreed; 20% strongly agreed) that they require more teacher input into decisions about hardware and software purchases. Ninety percent of the teachers agreed or strongly agreed (55% agreed; 35% strongly agreed) that they require help in incorporating computers into curriculum.

Table 6.17. Application Support Required by Non-TIP Teachers

Survey Questions [a]	SD 1 %	D 2 %	UD 3 %	A 4 %	SA 5 %	No Ans	Mean	sd
In order for me to increase the use of computer technology with students, I require ...								
More curriculum-specific software.	0 (0)	5.0 (1)	5.0 (1)	35.0 (7)	55.0 (11)	0 (0)	4.4	0.8
Access to class sets of software.	0 (0)	5.0 (1)	40.0 (8)	45.0 (9)	10.0 (2)	0 (0)	4.4	0.8
More teacher input into decisions about hardware and software purchases.	5.0 (1)	15.0 (3)	15.0 (3)	35.0 (7)	20.0 (4)	10.0 (2)	3.6	1.2
Help in incorporating computers into curriculum.	0 (0)	0 (0)	10.0 (2)	55.0 (11)	35.0 (7)	0 (0)	4.3	0.6

Note. Numbers in brackets denote frequencies of responses

1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree; and

No Ans= No Answer.

[a]n = 20

Hardware and Technical Support Required by Non-TIP Teachers

Table 6.18 summarized the results of teachers' responses concerning teachers' requirement for access to hardware and technical support. Table 6.18

shows that 85% of the teachers agreed or strongly agreed (35% agreed; 50% strongly agreed) that they required access to up to date computers for themselves. Seventy five percent of the non-TIP teachers agreed that they need access to up-to-date computers for their students (25% agreed; 50% strongly agreed).

Table 6.18. Hardware and Technical Support Technical Support (Non-TIP)

Survey Question ª	SD 1 %	D 2 %	UD 3 %	A 4 %	SA 5 %	No Ans	Mean	sd
In order for me to increase the use of computer technology with students, I require ...								
Access to up-to-date computers for myself.	5.0 (1)	5.0 (1)	5.0 (1)	35.0 (7)	50.0 (10)	0 (0)	4.2	1.1
Access to up –to-date computers for my students.	5.0 (1)	10.0 (2)	10.0 (2)	25.0 (5)	50.0 (10)	0 (0)	4.1	1.2
Someone in the school to help in the maintenance of the networking of computers.	5.0 (1)	10.0 (2)	35.0 (7)	45.0 (9)	5.0 (1)	0 (0)	4.2	1.0
Access to timely technical and on-site help.	5.0 (1)	0 (0)	0 (0)	45.0 (9)	50.0 (10)	0 (0)	4.4	1.0

Note. Numbers in brackets denote frequencies of responses

1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree; and

No Ans= No Answer.

ªn = 20

Table 6.18 shows that 35% of non-TIP teachers were undecided as to whether they agreed they need someone in the school to help in the maintenance of the networking of computers. Ninety five percent of the respondents agreed or strongly agreed (45% agreed; 50% strongly agreed) that they require access to timely technical and on-site help.

Training Strategies Required by Non-TIP Teachers

Table 6.19 summarized non-TIP teachers' requirement for training strategies for the integration of computer technology with curriculum. Table 6.19 shows that 85% percent of the respondents agreed or strongly agreed (40% agreed; 45% strongly agreed) with the statement that "I require training in the use of strategies for the reorganization of my class for integrating computers in the classroom or the computer lab."

Table 6.19. Strategies Required by Non-TIP Teachers

Survey Question [a]	SD 1 %	D 2 %	UD 3 %	A 4 %	SA 5 %	No Ans	Mean	sd
In order for me to increase the use of computer technology with students, I require								
Training in the use of strategies for the reorganization of my class for integrating computers in the classroom or the computer lab.	0 (0)	5.0 (1)	10.0 (2)	40.0 (8)	45.0 (9)	0 (0)	4.3	0.9
Training in the use of strategies, activities or approaches in teaching that will help me integrate computer technology into the curriculum.	0 (0)	5.0 (1)	10.0 (2)	35.0 (7)	45.0 (9)	5.0 (1)	4.3	0.9

Note. Numbers in brackets denote frequencies of responses

1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree; and No Ans= No Answer.

[a] n = 20

Table 6.19 shows that 80% of the teachers agreed or strongly agreed that they require training in the use of strategies, activities or approaches in teaching in order to integrate computer technology into the curriculum (35% agreed; 45% agreed strongly). Ten percent of the teachers were undecided about the issue.

School and Administrative Support Required by Non-TIP Teachers

Table 6.20 summarized the results of teachers' responses concerning school and administrative support. Forty five percent of the teachers agreed or strongly agreed (20% agreed; 25% strongly agreed) that they require more administrative support. Thirty five percent of them were undecided about the issue. Seventy percent of the teachers agreed or strongly agreed that they require easier scheduling of facilities (45% agreed; 25% strongly agreed).

Table 6.20. School and Administrative Support (Non-TIP Teachers)

Survey Question[a]	SD 1 %	D 2 %	UD 3 %	A 4 %	SA 5 %	No Ans	Mean	sd
In order for me to increase the use of computer technology with students, I require ...								
More administrative support.	10.0 (2)	10.0 (2)	35.0 (7)	20.0 (4)	25.0 (5)	0 (0)	3.4	1.3
Easier scheduling of facilities.	0 (0)	10.0 (2)	15.0 (3)	45.0 (9)	25.0 (5)	5.0 (1)	3.9	1.0

Note. Numbers in brackets denote frequencies of responses

1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree; and

No Ans= No Answer.

[a]n = 20

CHAPTER VII

DISCUSSION OF RESULTS

This chapter presents a discussion of findings of quantitative data and qualitative data from the TIP group, followed by a discussion of findings from the non-TIP group. This study was designed to address the research question: What impact did the TIP have on teachers with regard to computer usage? The discussion of results is based on the findings of quantitative data of the survey and qualitative data of the interviews mentioned in previous chapters. The connection between the impact of the TIP and theories of change and theories of adoption of computer technology as an educational innovation will be explored.

Discussion of Findings of Quantitative Data From TIP Participants

The findings of the data gathered from the TIP group will be discussed in the following ways. The impact of the TIP is discussed in terms of the research sub-questions and results are examined for possible consistency with the theories of change or education innovation. Findings will also be compared with similar studies presented in the literature review. The major conclusions of the effect of the TIP on participants are presented below.

Results of t Tests on Level of Expertise and Computer Usage

Results of the t tests showed that the TIP seems to have made a significant impact on the participants with regard to their self-reported knowledge and skill in using a computer. The TIP also seemed to have made a significant impact on the participants with regard to the use of computers for teaching and non-teaching purposes.

Attitude and Confidence in Computer Usage

The TIP participants reported being more confident in using a computer. They also reported being more proficient in using a computer and exhibited a more favorable attitude toward computer technology for teaching and learning. An overwhelming majority of TIP participants held the opinion that computers should be used for learning (89%) and that the computer is an effective tool for teaching and learning (92%). However, only half of the teachers agreed that they were confident with using computer technology in delivering instruction.

Impact of TIP Training Program and Interest in Computer-related Activities

The TIP was reported to have made positive impact on its participants regarding the use of the Internet, clip art and word processing. It neither made a great impact on integrating computers with content areas nor with the computer applications such as spreadsheets, data bases or transferring data between applications.

The TIP appears to have increased participation in computer related activities such as reading books, articles or magazines, and attending conferences on computer technology. As well, the TIP computer, a component of the TIP program, appears to have influenced some participants toward the purchase of a computer.

Factors of Usage (Other Than TIP)

When asked about influential factors other than the TIP, the TIP participants identified a necessity to learn to use computers for report card purposes and needs of students as one of the reasons for the increased use of computers. They also identified help from family, colleagues and friends and having access to computers in school or classroom to be other factors for their increased use of computers.

Perceived Needs of Teachers

Participants in the TIP indicated a need for (a) people support, (b) help in applying technology in classroom, (c) access to hardware and technical support, (d) training strategies, and (e) school and administrative support.

Relationship of TIP to Theories of Innovation

Fullan (1992) considered the implementation of microcomputers to be an "innovation problem" when teachers or community groups attempted to make more effective use of microcomputers. According to Fullan, the four phases of the process of change for innovations are: (a) initiation and participation, (b) pressure and support, (c) changes in behaviour and beliefs, and (d) ownership or institutionalization. The relationship of TIP to the four phases of the process of change proposed by Fullan is discussed below.

Initiation and Participation

Referring to active initiation and participation, Fullan (1992) pointed out that changes require some impetus to get started and that ". . . active initiation, starting small and thinking big, bias for action and learning by doing are all aspects of making change more manageable by getting the process underway in a desirable direction" (p. 25). Szabo's (1996) system of innovation, TIES, begins with (a) a strong administrative vision of how instruction technology should be used, coupled with (b) evidence of commitment to support that vision. The fact that the TIP became a program is clear evidence of a strong administrative commitment to teachers' use of technology, irrespective of vision. Such visible evidence does not go unnoticed among school personnel. When the TIP was initiated and teachers were asked to indicate their interest and commitment for the program, three hundred and seventy one teachers applied to enroll in the TIP.

The TIP was organized in such a way that it brought a group of teachers together who had similar backgrounds in their knowledge of computers: they were all new to the computer platform for which they were to receive training in. It was "thinking big" on the part of the administration when they decided to provide teachers, who were novice users of computer technology, with inservice training and a computer for their personal use for a period of one year.

Pressure and Support

The availability of technologies for work, entertainment and communication in the past few years have added pressure for educators to implement technology in their classrooms. Some parents are demanding that computer technology be integrated into the curriculum. The school board in which the TIP and non-TIP teachers are employed has made the implementation of computer technology in the district as one of its district priorities.

The TIP participants identified the necessity, hence the pressure, to learn to use computers for report card purposes and needs of students as one of the reasons for the increased usage of computers. The school board in which the TIP teachers were employed initiated computerized report cards for the whole district about three years ago. Most schools had to adapt to the change of issuing computer-generated report cards about two years ago, when the TIP was initiated. Elementary teachers had to adjust to issuing computer report cards which could be quite lengthy, especially for elementary students. Perhaps this explains why so many elementary teachers volunteered for the TIP. Close to 43% of the TIP participants were from Division One and 26% were from Division Two.

The initiation of the TIP provided teachers with some of the support needed for the implementation of innovations as advocated by Fullan (1992). In examining the barriers to use of computer technology in Alberta schools, Schwarz (1996) reported that, in order to improve the use of technology with students, the needs of teachers with regard to organizational, resource and training issues had to be met. The TIP has, to a degree, provided the support, namely the organization, resource and training needed for its participants to implement technology in the classroom.

Changes in Behaviour and Beliefs

According to Fullan (1992) ". . . The key issue from an implementation perspective is how the process of change unfolds *vis-à-vis* what people *do* (behaviours) and *think* (beliefs) in relation to a particular innovation" (p.22). The TIP seemed to have resulted in a change of behaviour in the usage of computers among its participants. As mentioned earlier, the TIP has made a significant impact on the participants with regard to the number of hours they use the computers for teaching and non-teaching purposes. They also kept themselves up to date with computer related activities one year after the TIP training.

The initiated involvement and support provided by the TIP seems to have changed the attitude and beliefs among the participants. Over half of them strongly agreed that, as a result of the TIP, they felt (a) more confident in using a computer in general, (b) more confident in using a computer for word-processing (c) they had a more favorable attitude towards the use computers in general, and (d) they were more proficient in using computer technology. About 62% of them agreed or strongly agreed that they felt more confident in using a computer for lesson-planning. Although 32% of the teachers were undecided about the issue, 50% of them agreed or strongly agreed that they felt more confident in using a computer for delivering instruction.

Ownership or Institutionalization

Institutionalization refers to the final stage of successful implementation when the innovation is clearly proven to be usable, effective and acceptable. Schwarz (1996) surveyed 3,000 teachers in Alberta, and found that more than one quarter of all teachers did not use computers. In addition, more than three-quarters of all teachers who responded indicated that they used computers less than two hours per week. In comparison, the TIP participants reported that they were averaging 2.1 hours in computer usage per week before training from the TIP and after training from the TIP, they were using computers for 7.8 hours per week, an increase of close to six hours per week. The significant increase, in hours of usage for teaching purposes, suggests that the TIP teachers may be adapting to the process of change. In addition to the significant increase in computer usage, TIP participants also experienced a change in the perception of their own level of expertise in using a computer. The TIP participants perceived a significant increase, with regard to knowledge and skill in using computers, after they had received training from the

TIP. They experienced a change in the perception of their own level of expertise in using a computer.

The combination of initiation, participation and the pressure and support provided by the program seemed to have led to a change of beliefs among the TIP participants. This, in turn, led to the initial stages of ownership or institutionalization of the implementation of computer technology among TIP participants. However, it should be emphasized that the results of findings do not seem to indicate that the TIP participants have reached the final stage of successful implementation in which the innovation is clearly proven to be usable, effective and acceptable. The results of findings show that the TIP participants have changed from novice users of computer technology to adopters of the innovation.

TIP Training, Access to Computer and Innovation Theories

The combination of the TIP training and having access to a computer provided the TIP participants with the time and opportunity to try to learn about the technology and to make decisions on whether to use them at work or at home. This supports the theories of innovation. Rogers (1995) claimed that in order for an innovation to be adopted, adopters of an innovation must know what the innovations are, be persuaded that the innovation is worth adopting, make the decision to adopt the innovation, implement the innovation and make confirmation decisions to either adopt or reject the innovation. After having received training from the TIP and having had a computer on loan to them for one year, the TIP participants had the time, training, equipment and opportunity to find out what the innovation was (computer technology and what it involved). In other words, they were also given a chance to be persuaded that the innovation (use of computer for teaching) was worth adopting. Sixty eight percent of the teachers who received the computer on loan to them for one year (TIP computer) perceived the TIP computer to be a factor which influenced them to considerable increased use of computer. Teachers reportedly perceived significant increased usage of computers at home and at work. Sixty out of 131 (46%) of the TIP teachers who responded to the open-ended question attributed the increase of usage to the availability of the TIP computer. In this way, TIP participants showed the signs of what Rogers (1995) described as adopters of innovations

Although the TIP participants showed signs of being adopters of computer technology, they still have a long way to go before it could be said that they are fully implementing technology in the classroom. This is reflected by the following data.

1. The percentage of teachers using the multimedia software and the application programs such as data base and spreadsheets are low. Twelve percent of teachers reported considerable increased use of spreadsheets; 11% of teachers reported considerable increased use of data bases.
2. Thirty two percent were undecided about whether they agreed that they felt more confident in using a computer for delivering instruction. Fifty percent agreed that they were confident with using a computer for delivering instruction.
3. Only 23% of the TIP participants reported considerable increase in the integration of computer with content areas.

In order to understand why less than 12% of the teachers reported considerable increased use of the application programs of spreadsheets and data bases, it might be helpful to consider the following. Sixty nine percent of the TIP participants were elementary teachers (43% in Division One and 26% in Division Two). These elementary teachers were not given training in the TIP to learn the data base and spreadsheet application programs; training in these areas was only offered to the Division Three and Division Four teachers. This may partially explain why the majority of TIP teachers did not report much increase in the usage of the computer application programs of data bases and spreadsheets.

Teachers' Perception of What They Need

The TIP participants have reconfirmed that, in order for them to adopt computer technology as an innovation and to implement it in the classroom, support for the following needs must be met: (a) people support, (b) support for the application of technology, (c) support for access to hardware and technical help, (d) support for teaching strategies and (e) school and administrative support.

The above findings support the findings of Schwarz (1996) who reported that, in order to improve the use of technology with students, the needs of teachers with regard to organizational, resource and training issues must be met. At the school level, Schwarz suggested that a "supportive team environment" (p.172) needs to be created to provide teachers with opportunities to get the help they need in incorporating computers into the curriculum.

Fullan (1992) emphasized the use of new "teaching approaches" as being one of the essential elements for the successful implementation of innovations in the change process. He explained that change occurs with the use of new activities. The integration of computer technology with curriculum required new grouping strategies, new classroom organization, and new practices on the part of the teachers. Teachers first had to recognize the need for new teaching approaches. Once they were aware of the need, they would seek help in learning new strategies to deal with the change brought on by the new innovation to be implemented.

Eighty one percent of the teachers agreed or strongly agreed (43% agreed; 38% strongly agreed) that in order to use computer technology, they require training in strategies for the reorganization of classes. Eighty eight percent of them agreed or strongly agreed with the statement "I require training in the use of strategies, activities or approaches in teaching that will help me integrate computer technology into the curriculum." This support Fullan's (1992) theory of the necessity to provide teachers with the training for strategies in teaching approaches before implementation of technology could be institutionalized.

Summation of Discussion of Quantitative Data from TIP Participants

The findings of the impact of the TIP were generally compatible with the theories of change and innovations as suggested by the review of literature. Teachers adapted to the process of change in their early attempts to adopt computer technology as an innovation as a result of the impact of the training from the TIP.

However, there are many other factors in a complex social structure, such as a school district, which affect the change process. While it was not possible to completely isolate the effects of the TIP from this milieu of complexity, the TIP seems to have had a not insignificant impact.

Discussion of Findings From Interview Data

The interviews with the seven TIP participants left the researcher with the impression that the first year of the TIP was indeed very successful. The TIP seemed to have impacted the teachers in their use of computers in many ways.

Level of Expertise, Computer Usage and TIP Training

All of the interviewees claimed to have benefited from the summer session. They also claimed to have gained skills and knowledge in the use of computers. Not only did they learn to use some of the technical aspects of the platform, all of them applied what they learned by making plans for teaching, and to certain extent, attempted in their own ways to integrate technology with curriculum. Some were more successful than others in the implementation of technology in teaching, but the majority of them tried very hard to make it happen. One of the interviewees, who had never taught computers before, went on to teach computer courses to her students the year after she participated in the TIP.

Change of Attitude and TIP Computer

All of interviewees gained confidence in using a computer. All of them claimed that the TIP gave them a solid foundation in computer technology. The feature of the computer-on loan to teachers for a year was shown, by the interview data, to be the factor which made the difference in the increased usage of computer.

The fact that three of the interviewees spent their "hard earned money" and bought a computer as a result of the TIP, showed that the TIP made a great impact on them to the point where their behaviors (purchase) matched their expressed views. On the other hand, it could be argued that most professionals purchase their tools (e.g., the carpenter and the hammer). However, it should be kept in mind that, before the Internet was widely adopted a few years ago, quite a few teachers did not consider computer technology to be an essential tool for teaching. In fact, there are teachers who still may think that computer technology is just a fad and not to be taken seriously as a tool for teaching. The fact that some of the interviewees admitted that they purchased a computer as a result of TIP showed that TIP had made an impact in changing their attitude toward computer technology.

By purchasing a computer and using it as a tool for the instructional process, the TIP teachers have adopted a change of attitude and seemed begin to lean, to a degree, towards the instrumentalist point of view advocated by Surry. Surry (1997) proposed that instrumentalists view technology as a tool which could be used either positively or negatively by the user. He also believes that adoption of innovations comes about gradually and that the users of technology will show us how innovations would be adopted by society. Perhaps the TIP participants could show us how the innovation of computer technology could be fully adopted and institutionalized in the educational setting in the future.

Influence of Factors Other Than TIP

The interviewees identified barriers which prevented teachers from successfully implementing computer technology in their classrooms. While accessibility to computers was a major issue for elementary school students, interviewees from high school and junior high schools found that they had easy access to computers for themselves and for their students. They were provided with an up-to-date computer in their own classroom and a computer lab for their students.

Elementary teachers who were interviewed complained about having to use a sub-standard and inadequate supply of hardware. One of the interviewees did not have access to computers for her Division One students because there were not enough computers even for Division Two students in her school. A Division Two teacher complained that even though there was a computer lab in the school, it was not adequate since technical help was not readily available. He pointed out that the school computer used by the office seemed to get immediate attention whenever repair was needed but when the computers used by students broke down, it often took weeks, if not months, to get them fixed.

Not knowing how to set up computers could be another barrier for usage. Even though the TIP participants were taught how to set up the computers, two of the interviewees did not set up their own computers at home. If these teachers, who had training in setting up the computer found it difficult to set them up themselves, it could also be a deterrent for other teachers who did not have such training.

Possible Implementation Issues

Two of the interviewees did not seem to be aware of the need for different approaches for the implementation of computers in teaching. For example, teaching approaches which involve new strategies for the integration of technology with curriculum. Furthermore, many of the problems that need to be addressed for the implementation of technology in classrooms are related to local area networks and their connections. Since the TIP used stand-alone, rather than networked computers, participants of TIP may not have been aware of network problems. This too, could have been a road block for the implementation of technology in the classroom.

TIP Training Program

It appeared that the majority of the interviewees were knowledgeable about using CD ROM, word processing, and the Internet for teaching. These were the software applications that they were taught to use in the TIP training. The reason why the TIP teachers were not using other software applications for teaching (such as spreadsheets, data bases) could be due to a lack of training. Perhaps if the Saturday sessions could be improved, it might have made a difference in the teachers' implementation of technology in the classroom. The majority of the interviewees observed that the Saturday sessions were inadequate and did not meet their needs of wanting to learn how to implement computer technology into the curriculum. Another reason why the interviewees were not using software applications such as data base, was that it was too much and too soon to ask the teachers to do more than what they had done, after their initial training.

Summation of Discussion of Findings From Interview Data

It was obvious from the interviews that the respondents had different reasons for their participation in the TIP. However, it was also clear that, overcoming the fear of technology and the change to a positive attitude towards using technology, were some of the significant impacts of the TIP. The TIP had significant impact on teachers' usage of computers and on changing the attitudes of teachers towards the usage of computers as educational tools. Teachers perceived that they need help in the implementation of technology with curriculum. The interviewees identified barriers which prevented them from the successful implementation of computer technology in their classrooms. In general, the findings support the conclusions made by Szabo and Schwarz (1997) which stated that in addition to training, teachers require a broad range of support (infrastructure) and the ability to adopt the innovation to unique needs (Tyack & Cuban, 1995).

Discussion of Findings of Data From Non-TIP Teachers

Three of the non-TIP respondents received training, support and had access to hardware similar to what the TIP participants had received. These three non-TIP respondents constituted 15% of the sample for the non-TIP group. The details of the conditions of the three non-TIP teachers in question are reported below.

The first two respondents applied to participate in the first TIP and were rejected. Hence they legitimately belong to the sample group of non-TIP teachers. Since they were rejected, their principal made it possible for them to enroll in the two week summer TIP course by providing school funds. These two respondents had been identified by their principals as having attended the two week summer course. They were also identified as having been given access to a used computer for the summer from their respective schools instead of an up-to-date computer from the TIP for a year. The only differences between these two non-TIP teachers and the TIP participants was that they did not get personal access to a computer for the whole year and that they had the option not to attend the four Saturday sessions, should they choose to do so. These two TIP teachers identified themselves as having gone through the two week summer sessions and having access to a computer in the summer, but they did not specify whether they attended the Saturday sessions. The significance of these observations may be in the fact that the principal took action in recognition of the growing need to increase appropriate use of computers in the school.

The third respondent, who will be identified by the pseudonym Daisy, also applied to participate in the TIP and was rejected for the first year of TIP. Daisy reported that from that time, she was given support fully from her principal in implementing computer technology with curriculum. She stated she had,

> A PC [Personal Computer] on my desk at school and home; every week a technician comes to our school; we choose our hardware [referring to teacher input decisions about hardware on questionnaire]; inserviced [referring to being shown how to use computers on questionnaire]; constant staff help [referring to continuous training in use of computers to gain confidence in usage on questionnaire]; six PC put in my classroom for students; and, teachers' aide with PC knowledge.

In answer to the open-ended question about the main factors which increased her usage of computers, Daisy further explained, "All of the above. I have a very supportive administrator and I have been given all of the tools to succeed. I have my own PC at home also (recently purchased at Christmas)."

In answer to the open-ended question about the main factors which prevented her from the increased usage of computers, Daisy commented, "I have no reason not to increase my usage of computers. I am very fortunate at my school."

Since principals knew about the existence of the TIP program, they might be trying to keep up with what was happening in the district by giving teachers, who volunteered but were rejected by the TIP, as much support as they could afford to give. This could very well have been a confounding factor to the findings of the non-TIP group.

Discussion of Results of Non-TIP Group

The following discussion of results refer to the comparison of results between two time periods perceived and rated by non-TIP group: the period prior to July, 1996 and the period at the time of the survey (March, 1998). Non-TIP teachers seemed to have made significant increases in knowledge and skill in using a computer as well as in computer usage for teaching purposes. They seemed to have gained more confidence in using computer technology. They also seemed to have acquired a more favourable attitude towards computer technology for teaching and learning.

Non-TIP teachers appeared to participate in computer related activities such as reading books, articles or magazines, and attending conferences on computer technology. They also seemed to have increased the usage of word processing. However, they did not seem to show much increase in their use of the multimedia software and the application programs of transferring data between applications, spreadsheet and data base.

The non-TIP group identified usage of computers for report cards as one of the factors which increased their computer usage. They identified having no time as a reason which prevented them from increasing their use of computers.

Non-TIP teachers reported that, in order to increase the use of computers with their students, they needed (a) people support, (b) help in applying technology in classroom, (c) access to hardware and technical support, (e) training strategies, and (f) easier scheduling of facilities.

Summation of Discussion of Findings of Data From Non-TIP Teachers

Since the non-TIP group originally volunteered for participation in TIP, their motivation to adopt computers as an innovation might well have been as high as the TIP participants. The popularity of the Internet, which reached new heights about two years ago, might have been a catalyst in causing the non-TIP teachers to try to learn more about computers on their own, without the benefit of a formal training program such as the TIP. The fact that over one third of the teachers identified the usage of computers for report cards showed that there was a need for the non-TIP teachers to adapt to the changing process of having to adopt computer technology as an innovation to be incorporated in their classrooms.

All the above mentioned factors combine to suggest why the non-TIP group seemed to have gained confidence in skill and knowledge in their ability to use the computer and have shown a tendency to adopt computer technology as an innovation for teaching and learning.

Conclusion and Recommendations

This study was concerned with the research question, “What impact did the TIP have on teachers with regard to computer usage?” The TIP impacted teachers’ usage of computers in a significant way because it addressed the needs of the teachers in the implementation of computer technology by supporting them in their adaptation to the process of change. The TIP was the beginning of a process in which teachers began the adoption of computer technology in their classrooms. An analysis of the TIP, from findings of quantitative and qualitative data of this study, showed that the main reason for the success of the TIP was that the implementation of computer technology was looked at as an embedded innovation problem in which teachers had to be adapting to the process of change. Teachers were involved with the change process. They knew what the innovation was. Their training, organization and resource needs were beginning to be met within the TIP. They were given the time to try the innovation for a one year period so they could make informed decisions as to whether to adopt or reject the innovation. More teacher input into decisions about the content of the inservice program for the inservice sessions would be helpful for future programs modeled on the TIP.

As TIP participants demonstrated the characteristics of adopters of the innovation of computer technology, the challenge of institutionalization lies ahead for the school district which initiated the TIP. As recommended by Fullan (1992), the ultimate adoption of an innovation for implementation was the institutionalization of the innovation. Institutionalization of an innovation is a process in which the innovation is fully implemented by members of the group with support from the institution or community in which the members are involved. The major contribution of the TIP was the impetus which initiated the implementation of computer technology as an educational innovation in a large school district.

Recommendations

Szabo (1996) proposed a model which begins with a vision from the senior administrative level, followed by the development, training and support of strategically placed leadership teams who are empowered to make the vision a reality in their own schools. In Szabo's model, a strong central support system is seen as counterproductive to change. Szabo's model could be considered for the implementation of computer technology in the classroom.

From a case study of implementation of new educational technologies in Ontario schools, Fullan (1992) included the following suggestions as the basic components of the institutionalization of technology for educational purposes:

> Appointment of curriculum and teaching computer support personnel, allocation of teacher planning time, in-service training for teachers in curriculum-based uses of the technology, release time for in-service, resource sharing among boards, dissemination of research findings about use of the technology, communication with parents about integration of the technology into the learning process (p.42).

In other words, teachers' requirement for organizational, resource and training support must be met in order for them to successfully implement technology as an educational innovation. In conclusion, the first Technology Incentive Program, though significant in its impact as to the influence it had on teachers with regard to their computer usage, is but a first step in the right direction. The school district must accept the challenge of supporting teachers with the further implementation of computer technology by helping to institutionalize the new technology for the school system.

Suggestions For Further Studies

1. Replicate this research on the TIP by comparing the impact of the TIP on its participants with a control group of teachers who are from other school districts.
2. Assess the second and third year of the TIP by comparing the impact of the TIP on its participants with a control group of teachers who are from other school districts.
3. Assess the impact of other district program similar to the TIP by doing actual experimental research. Evaluation measures should be taken before, during and after the district programs so as to assess impact.
4. Re-evaluate the status of institutionalization of computer technology within the school district one year after the last TIP program has been completed in the year 2000.
5. Follow the TIP participants for several years (longitudinal study) to ascertain changes in the effects found at the end of year one.
6. Observe the classroom activities of TIP participants with respect to changes in use of computers.
7. Test TIP participants on computer usage skills and knowledge.
8. Design and develop research on whether the use of computer technology has impact on student achievement.
9. Assess the influence of the goal and vision of the central administration and principal on teachers' pursuit of increased personal and school use of computers.

Significance Of The Study

The significance of this study lies in (a) its contribution to classroom practice by gathering data on how teachers attempted to implement computer technology in their classrooms within the TIP, and (b) its contribution to theory by relating a district initiative technology program with the theories of change and innovation in education. The details of the significance of the study are described under the following sub-headings of Contribution to Practice and Contribution to Theory.

Contribution to Practice

From the quantitative and qualitative data, it appeared that the TIP has made substantial impact on the TIP participants with regard to the usage of computers for teaching and non-teaching purposes. School systems may wish to consider similar Technology Incentive Program, at a district level, to help teachers in the implementation of technology with curriculum.

This research project analyzed the components of the TIP which contributed to the impact it had on computer usage among the TIP teachers. The fact that TIP participants were given computers on loan for one year for their personal use; that the training program took place in the summer; and that the teachers had a say which platform they wanted to learn from were factors which made an impact on teachers' usage of computers. To help teachers to better integrate technology with curriculum, it seems that the Saturday sessions could be organized with more teacher input. Perhaps more sessions on the implementation of computer technology with content areas could be offered by consulting with the teachers as to how best to approach the organization of the training sessions.

To sum up, the findings of data collected and the knowledge gained from this study may be useful for classroom practices as it may provide insight into factors that have impact on computer usage among teachers.

Contribution to Theory

In order to understand why computer technology is not being widely implemented in classrooms, we have to examine computer technology as an innovation, as well as looking at innovation as a part of the change process. Looking at the Technology Incentive Program in the context of innovation and change theories may help us understand why computer technology has not been adopted as an innovation and implemented in the instructional process in the educational setting (Fullan, 1992; Szabo, 1996). This research contributes to the application and adaptation of the theories of innovation and implementation of educational technology.

This study contributed to theory by examining how innovation theories were applied in the Technology Incentive Program. As stated in Roger's (1995) theory of diffusion innovation, the TIP participants were given time and opportunity to know what the innovations are, be persuaded that the innovation is worth adopting, make the decision to adopt the innovation, implement the innovation and make confirmation decisions to either adopt or reject the innovation. Fullan's theory (1992) that the implementation of microcomputers in the classroom is both a "policy phenomenon" and an "innovation problem" (p. 28) was reconfirmed by this study. The TIP program was a policy phenomenon when adoption of computer technology was initiated and supported by school district. It was an innovation problem when

TIP teachers attempted to make more effective use of microcomputers. Fullan's theory (1992) of "alteration of beliefs" is also confirmed in this study. According to Fullan, implementation is closely related to the process of change. Individuals affected by changes have to develop an understanding of the innovation being adopted. This understanding may lead to changes in beliefs in teaching and learning. The quantitative and qualitative data of this study has shown that TIP participants displayed significant changes in attitude and beliefs towards computer technology, as a result of the impact of the Technology Incentive Program.

Part of the reason why the TIP was judged to be successful by its participants was because of the fact that teachers had a need to adapt to the change process of attempting to adopt computer technology as an innovation. At least one fifth of both the TIP and the non-TIP teachers identified the necessity to learn to use computers for report card purposes and needs of students as a reason for the increased use of computers. This is one of few studies in which recent research was done on the implementation of computer technology at a district level. In these respects, the innovation theory for the implementation of computer technology is reconfirmed and extended in this research project.

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APPENDIX A-Survey of TIP Participants

A. Demographics

Please check the appropriate boxes:				
V 2.	☐	Female	☐	Male
V 3-6	☐ ☐	Division 1 (K - G. 3) Division 3 (G. 7 - 9)	☐ ☐	Division 2 (G. 4- 6) Division 4 (G. 10- 12)

B. Participation in Technology Incentive Program

Please check the appropriate boxes:			
V7.	I participated in the 1996-1997 Technology Incentive Program.	Yes	No

C. Level of Expertise in Computer technology

On a scale of 1 to 10, please rate yourself as to the level of expertise you have, with regard to computer technology.

1 = no knowledge and skill in computer technology

10= expert knowledge and skill in computer technology

V8.	**Prior to July, 1996 (or before TIP)**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
V9.	**As of today (or after TIP)**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

D. Computer Access and Related Activities

Please circle the appropriate column for the following questions.			
V10.	Did you have easy access to a computer at home before TIP?	Yes	No
V11.	Did you have easy access to a computer at home after TIP?	Yes	No
V12.	Do the students you teach have easy access to computers at school?	Yes	No
V13.	Did you attend any in-services or courses on computers for teaching /learning purposes during 1997-1998? (referring to in-services in addition to TIP)	Yes	No
V14.	Did you use microcomputers to in-service staff after TIP?	Yes	No
V15.	Did you read articles, journals or magazines on computer technology after TIP?	Yes	No
V16.	Did you attend any conference related to computer technology after TIP?	Yes	No

E. Use of Computers

Please indicate the number of hours you use the computer for the items listed below.

Computer Usage	**Hours Per Week (approx.)**	
	Before TIP	As of Today
For **teaching** (includes **everything related** to teaching, e.g. classroom use with students, planning, report cards, professional development, Internet, software, word processing, etc.)	V17.	V18.
For purposes other than **teaching.**	V19.	V20.

F. Changes in Use of Computers: (With Training Provided by TIP)

Training for the items listed below was provided by TIP.
Please circle the appropriate number to indicate whether you have increased the usage of following items.

- (1) **Considerable increase use** of the item (after TIP training)
- (2) **Moderate increase** use of item (after TIP training)
- (3) **Slight or small increase of use** of the item (after TIP training)
- (4) **No increase of use** of the item (after TIP training)
- (5) **I do not use** the item at home or at work (after TIP training)

V21.	Internet: Using search engines, Copying Files , WWW., Web documents, images, text. Using Netscape, visiting web sites, bookmarks	1	2	3	4	5
V22.	Word processing: All aspects, e.g. editing, saving files, spell check, newspaper columns, templates, using tables, thesaurus	1	2	3	4	5
V23.	Desktop publishing- producing text documents with graphics	1	2	3	4	5
V24.	Software: Encarta, Canadian Encyclopedia, etc.	1	2	3	4	5
V25.	Playing Audio CD on computer	1	2	3	4	5
V26.	Using clip art or drawings or graphics	1	2	3	4	5
V27.	PowerPoint or ClarisWorks Slide Show	1	2	3	4	5
V28.	Transferring data between applications, e.g. between PowerPoint/ Graphics to word processing	1	2	3	4	5
V29.	Spreadsheet	1	2	3	4	5
V30	Data Base	1	2	3	4	5
V31.	Integration of computer technology with the content area(s) I teach.	1	2	3	4	5

G. Changes in Use of Computers (Unrelated to TIP Training Program)

Training for the items listed below were not provided by TIP.
Please circle the appropriate number to indicate whether you have increased the usage of following items.

- (1) **Considerable increase use** of the item (after TIP experience)
- (2) **Moderate increase** use of item (after TIP experience)
- (3) **Slight or small increase of use** of the item (after TIP experience)
- (4) **No increase of use** of the item (after TIP experience)
- (5) **I do not use** the item at home or at work (after TIP experience)

V32.	Games	1	2	3	4	5
V33.	Creating web Pages	1	2	3	4	5
V34.	Participation in Listserv or Usenet	1	2	3	4	5
V35.	Email usage	1	2	3	4	5
V36.	Planning- any planning for teaching or professional purposes	1	2	3	4	5

H. Computer Provided by TIP and Usage

Please check the most appropriate response.	
V37. Did the **computer** (provided to you by TIP) increase **your use of computer** at home or at work? Please specify details on the right.	☐ 1. **Considerable increase** use of computers ☐ 2. **Moderate increase** use of computers ☐ 3. **Slight or small increase** use of computers ☐ 4. **No increase**

I. Computer Purchase and TIP

V38. Did you purchase a computer after TIP?	Yes		No
V39. **If your answer to the above question** (Q35) **is yes,** was TIP the major influence on your purchase of the computer?	Yes	No	Not Applicable

J. My Opinions

Please circle the appropriate responses: **(1) strongly agree (2) agree (3) undecided (4) disagree (5) strongly disagree**					
V40. I feel more confident with **using a computer** as a result of the Technology Incentive Program.	1	2	3	4	5
V41. I feel more confident in using a computer for **word- processing** as a result of TIP.	1	2	3	4	5
V42. I feel more confident in using a computer for **lesson- planning** purposes as a result of TIP.	1	2	3	4	5
V43. I feel more confident in using a computer for **delivering instruction** as a result of TIP.	1	2	3	4	5
V44. I think computer technology should be used in the classrooms for **teaching and learning purposes**.	1	2	3	4	5
V45. I feel that the use of computers for teaching is **just a fad**.	1	2	3	4	5
V46. Using computer technology is an effective way to enhance **learning**.	1	2	3	4	5
V47. As a result the Technology Incentive Program, I have a **more favorable attitude** towards the use of computers in general.	1	2	3	4	5
V48. I am using computers **more at home** as a result of TIP.	1	2	3	4	5
V49. I am using computers **more at work** as a result of TIP.	1	2	3	4	5
V50. As a result of TIP, I am more proficient in using computer technology.	1	2	3	4	5
V51. There are **other factors**, (other than TIP), which influence my use of computers.	1	2	3	4	5
V52. I am using computers more at home as a result of factors **other than** the Technology Incentive Program.	1	2	3	4	5
V53. I am using computers more at work as a result of factors **other than** TIP.	1	2	3	4	5
V54. I am using computers more as a result of **both** TIP and other factors.	1	2	3	4	5

K. Additional opinions about Computer Usage

Please circle the appropriate responses:

(1) strongly agree (2) agree (3) undecided (4) disagree (5) strongly disagree

In order for me to increase the use of computer technology with students, I require ...

V55.	Access to up-to-date **computers** for myself.	1	2	3	4	5
V56.	Access to up -to-date computers **for my students**.	1	2	3	4	5
V57.	More administrative **support**.	1	2	3	4	5
V58.	Easier **scheduling** of facilities.	1	2	3	4	5
V59.	**Someone in the school** to help in the maintenance of the networking of computers.	1	2	3	4	5
V60.	More curriculum-specific **software**.	1	2	3	4	5
V61.	Access to **class sets** of software.	1	2	3	4	5
V62.	**Assistance** in the school from other teachers.	1	2	3	4	5
V63.	Access to timely technical and **on-site help**.	1	2	3	4	5
V64.	More **teacher input** into decisions about hardware and software purchases.	1	2	3	4	5
V65.	Opportunities to work with colleagues **as a team**.	1	2	3	4	5
V66.	**Help** in incorporating computers into curriculum.	1	2	3	4	5
V67.	Help in the form of **hands-on training**.	1	2	3	4	5
V68.	**Being shown** how to use computers.	1	2	3	4	5
V69.	**Continuous training** in use of computers to gain confidence in usage.	1	2	3	4	5
V70.	Training in the use of **strategies for the reorganization of my class** for integrating computers in the classroom or the computer lab.	1	2	3	4	5
V71.	Training in the use of **strategies, activities or approaches in teaching** that will help me integrate computer technology into the curriculum.	1	2	3	4	5
V72.	**Time** to acquire computer skills and to learn about computer usage.	1	2	3	4	5

V73. The main factors which increased my Computer usage, **as a result of TIP,** are:

V74. The main factors which increased my computer usage, **not related to TIP,** are:

APPENDIX B-Survey of Non-TIP Teachers

A Demographics

Please check the appropriate boxes:				
V2.	☐	Female	☐	Male
V3-6.	☐	Division 1 (K -G. 3)	☐	Division 2 (G. 4-6)
	☐	Division 3 (G.7 – 9)	☐	Division 4 (G. 10-12)

B. Participation in Technology Incentive Program

Please check the appropriate boxes:		
V7. I applied for the Technology Incentive Program but was not selected.	Yes	No

C. Level of Expertise in Computer technology

On a scale of 1 to 10, please rate yourself as to the level of expertise you have with regard to computer technology.

1 = no knowledge and skill in computer technology

10= expert knowledge and skill in computer technology

V8.	**Prior to July, 1996**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
V9.	**As of today**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

D. Computer Access and Related Activities

Please circle the appropriate column for the following questions.			
V10.	Did you have easy access to a computer at home prior to July, 1966?	Yes	No
V11.	Do you have easy access to a computer at home now?	Yes	No
V12.	Do the students you teach have easy access to computers at school?	Yes	No
V13.	Did you attend any in-services or courses on computers for teaching /learning purposes this year (1997-1998) ?	Yes	No
V14.	Did you use microcomputers to in-service staff during 1997- 1998?	Yes	No
V15.	Do you read articles, journals or magazines on computer technology?	Yes	No
V16.	Did you attend any conference related to computer technology in 1997-1998?	Yes	No

E. Use of Computers

Please indicate the number of hours you use the computer for the items listed below.

Computer Usage	**Hours Per Week (approx.)**	
	Before July, 1996	As of Today
For teaching (includes everything related to teaching, e.g. classroom use with students, planning, report cards, professional development, Internet, software, word processing, etc.)	V17.	V18.
For purposes other than **teaching.**	V19.	V20.

F. Changes in Use of Computers: Part I

Please circle the appropriate number to indicate whether you have increased the usage of following items since July, 1996.

(1) Considerable increase use of the item
(2) Moderate increase use of item
(3) Slight or small increase of use of the item
(4) No increase of use of the item
(5) I do not use the item at home or at work

V21.	Internet: Using search engines, Copying Files , Web documents, images, text. Using Netscape, Internet explorer, visiting web sites, bookmarks	1	2	3	4	5
V22.	Word processing: All aspects., e.g. editing, saving files, spell check, newspaper columns, templates, using tables, thesaurus	1	2	3	4	5
V23.	Desktop publishing- producing text documents with graphics	1	2	3	4	5
V24.	Software: Encarta, Canadian Encyclopedia, etc.	1	2	3	4	5
V25.	Playing Audio CD on computer	1	2	3	4	5
V26.	Using clip art or drawings or graphics	1	2	3	4	5
V27.	PowerPoint or ClarisWorks Slide Show	1	2	3	4	5
V28.	Transferring data between applications, e.g. between PowerPoint/ Graphics to word processing	1	2	3	4	5
V29.	Spreadsheet	1	2	3	4	5
V30.	Data Base	1	2	3	4	5
V31.	Integration of computer technology with the content area(s) I teach	1	2	3	4	5

G. Changes in Use of Computers: Part II

Please circle the appropriate number to indicate whether you have increased the usage of following items since July, 1996.

(1) Considerable increase use of the item
(2) Moderate increase use of item
(3) Slight or small increase of use of the item
(4) No increase of use of the item
(5) I do not use the item at home or at work

V32.	Games	1	2	3	4	5
V33.	Creating web Pages	1	2	3	4	5
V34.	Participation in Listserv or Usenet	1	2	3	4	5
V35.	Email usage	1	2	3	4	5
V36.	Planning- any planning for teaching or professional purposes	1	2	3	4	5

H. Computer Access and Usage

Please check the appropriate responses.		
V37.	**If I had easier or better access to a computer, I think my usage of computers would increase, as specified on the right.**	☐ 1. **Considerable increase** use of computers ☐ 2. **Moderate increase** use of computers ☐ 3. **Slight or small increase** use of computers ☐ 4. **No increase**

••

J. My Opinions

Please circle the appropriate responses:						
(1) strongly agree (2) agree (3) undecided (4) disagree (5) strongly disagree						
V40.	I feel more confident with **using a computer** since 1996.	1	2	3	4	5
V41.	I feel more confident in using a computer for **word- processing** since 1996.	1	2	3	4	5
V42.	I feel more confident in using a computer for **lesson- planning** since 1996.	1	2	3	4	5
V43.	I feel more confident in using a computer for **delivering instruction** since 1996.	1	2	3	4	5
V44.	I think computer technology should be used in the classrooms for **teaching and learning purposes**.	1	2	3	4	5
V45.	I feel that the use of computers for teaching is **just a fad**.	1	2	3	4	5
V46.	Using computer technology is an effective way to enhance **learning**.	1	2	3	4	5
V47.	Since 1996, I have a **more favorable attitude** towards the use of computers in general.	1	2	3	4	5
V48.	I am using computers **more at home** since 1996.	1	2	3	4	5
V49.	I am using computers **more at work** since 1996.	1	2	3	4	5
V50.	Since 1996, I am **more proficient** in using computer technology.	1	2	3	4	5
V51.	I am using computers more at home as a result of **non-credit courses or workshops**.	1	2	3	4	5
V52.	I am using computers more at work as a result of having taken **formal credit courses**.	1	2	3	4	5
V53.	I am using computers more at home as a result of **learning from family, friends, colleagues, and others**.	1	2	3	4	5
V54.	I am using computers more as a result of **learning on my own** (reading manuals, hands-on experiences).	1	2	3	4	5

K. Additional opinions about Computer Usage

Please circle the appropriate responses:

(1) strongly agree (2) agree (3) undecided (4) disagree (5) strongly disagree

In order for me to increase the use of computer technology with students, I require ...

V55.	Access of up-to-date **computers for myself.**	1	2	3	4	5
V56.	Access of up-to-date computers **for my students.**	1	2	3	4	5
V57.	More administrative **support.**	1	2	3	4	5
V58.	Easier **scheduling** of facilities.	1	2	3	4	5
V59.	Someone in the school to help in the maintenance of the networking of computers.	1	2	3	4	5
V60.	More curriculum-specific **software.**	1	2	3	4	5
V61.	Access to **class sets** of software.	1	2	3	4	5
V62.	**Assistance** in the school from other teachers.	1	2	3	4	5
V63.	Access to timely technical and **on-site help.**	1	2	3	4	5
V64.	More **teacher input** into decisions about hardware and software purchases.	1	2	3	4	5
V65.	**Opportunities to work with colleagues as a team.**	1	2	3	4	5
V66.	**Help** in incorporating computers into curriculum	1	2	3	4	5
V67.	Help in the form of **hands-on training.**	1	2	3	4	5
V68.	**Being shown** how to use computers.	1	2	3	4	5
V69.	**Continuous training** in use of computers to gain confidence in usage.	1	2	3	4	5
V70.	Training in the use of **strategies for the reorganization of my class** for integrating computers in the classroom or the computer lab.	1	2	3	4	5
V71.	Training in the use of **strategies, activities or approaches in teaching** that will help me integrate computer technology into the curriculum.	1	2	3	4	5
V72.	**Time** to acquire computer skills and to learn about computer usage.	1	2	3	4	5

V73. Since July, 1996, the main factors which increased my usage of computers are:

____

____

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V74. The main factors which prevent me from the increased usage of computers are:

____

____

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APPENDIX C-Interview Schedule

Procedures and Topics for Semistructured Interviews

- Memory and impressions: things they most enjoy, rewarding experiences, things they want to improve, things they like to keep.
- Ways TIP help in usage of computers.
- How can TIP be improved?
- Amount of time they used the computers on loan to them during 1996-1997.
- Are they still using the computer at home and at work?
- What made them want to continue or discontinue using the computer.
- What are the obstacles in using computers for teaching, why?
- Training, organization, tools, time commitment.
- What they have tried in teaching.
- What will they try in future?
- What obstacles ahead?
- What are potentials for future?
- Is there a change of teaching approaches, how and why?
- Is there a change of attitude towards computer usage, how and in what way?
- Other expectations or surprise out of TIP experience.
- Other Comment
- Questions interviewees have for the researcher.

9. Conclusion Remarks:

Transcript will be provided to them [interviewees]. Interpretation of interviews will be presented.

They will be asked to provide feed back.

APPENDIX D-Letter to TIP Teachers

Dear Colleagues,

My name is Catherine Suen and I was one of the participants of the first year of the Technology Incentive Program (TIP), which was initiated during the school year 1996-1997. I am, at present, a graduate student of the University of Alberta. As part of master degree requirements, I am conducting a research on the impact of TIP on teachers with regard to the use of computers and their attitudes towards computers usage.

For the research, I am interested in surveying all teachers who applied to the first TIP in 1996; i.e. all teachers who participated in the first year of the Technology Incentive Program and all teachers who were unsuccessful in getting accepted into TIP. Your voluntary participation in the research is requested.

I will appreciate it very much if you could fill out the enclosed questionnaire and return it on Wednesday, February 25, 1998 (the day before the Teacher's Convention) and return it in the self-addressed envelope provided, via the truck-mail system. The survey takes approximately 15 minutes to complete.

The validity of this research depends on a high response rate from you, the respondents. The findings of the research will provide criteria to be used for the development of future technology innovation projects.

The information you provide will be kept strictly confidential and anonymous. Only group data will be reported so you will not be identified. By completing the questionnaire, you have agreed to take part in this study. However, you may, without penalty of any kind, withdraw from this study at any time by not completing the questionnaire.

To ensure your anonymity, the questionnaire will not have any marks which could identify you. Please do not write your name on the survey. However, I need to know who has responded so **I could check your name off the mailing list when your questionnaire is returned so that I do not inconvenience you with a follow-up letter or phone call.** Enclosed is a Notification Form which you are kindly requested to fill out and return to me to let know that you have responded or that I should not be giving you a follow-up phone call. The Notification Form should be sent to me, a few days after you sent me the survey, under separate covers, so your name will not be identified.

All teachers who respond to the survey and will be eligible for a draw of prizes. The Notification Form will be used for a draw of prizes. The Notification Form will be discarded **before** your responses are analyzed. No one except I , my research assistants and my supervisor, will have access to the data you provide. As a further safeguard, all files with names will be destroyed at the completion of the study.

At the conclusion of the study, a **small prize**, donated by the OA Group Company, will be mailed to the **first 240 teachers** who respond to the survey. Respondents are also eligible for a draw of **seven prizes**-- consisting a software package (ClarisWorks Office) donated by West World Computers Ltd; a book and five pairs of movie tickets. The draw for the seven prizes will take place sometime before June 30, 1998. Your contribution is much appreciated.

Yours truly,

Catherine Suen

APPENDIX E-Factors and Factor Loadings

Table E. 1

Varimax Factor Solution for 15 variables

Concerning Teachers' Attitudes and Usage- Using Four Factors

	Section J of Survey: Teachers' Opinions (variables 40 to 54)	Factors and Factor Loadings			
		TIP Teachers' Attitude *	Influence of TIP & Non-TIP factors	Teacher's Opinion about Computer Usage	TIP Teachers' Computer Usage at Home
V50	As a result of TIP, I am more proficient in using computer technology.	**.80947**	-.05336	.16590	.02542
V41	I feel more confident in using a computer for word-processing as a result of TIP.	**.80924**	-.14754	.07503	.02756
V40	I feel more confident with using a computer as a result of the Technology Incentive Program.	**.78052**	-.07064	.20789	.04928
V49	I am using computers more at work as a result of TIP.	**.70652**	.23385	.19417	-.11180
V42	I feel more confident in using a computer for lesson-planning purposes as a result of TIP.	**.70135**	-.20111	.04521	.24589
V47	As a result of the Technology Incentive Program, I have a more favorable attitude towards the use of computers in general.	**.66847**	.09821	.29719	.05529
V43	I feel more confident in using a computer for delivering instruction as a result of TIP.	**.58390**	.00049	.27047	.24772
V53	I am using computers more at work as a result of factors other than TIP.	-.19466	**.83754**	-.02432	.02072
V54	I am using computers more as a result of both TIP and other factors.	.25078	**.82198**	.07135	-.02128
V51	There are other factors, (other than TIP), which influence my use of computers.	-.12085	**.75008**	.06752	.15407
V52	I am using computers more at home as a result of factors other than the Technology Incentive Program.	-.08644	.45355	-.05286	**.78787**
V44	I think computer technology should be used in the classrooms for teaching and learning purposes.	.21134	.05352	**.83554**	.16605
V46	Using computer technology is an effective way to enhance learning.	.15494	.08949	**.83207**	04348
V45	I feel that the use of computers for teaching is just a fad.	.33595	.04858	**-.69759**	.17681
V48	I am using computers more at home as a result of TIP.	.41880	-.11385	.11400	**.77807**

* represents short title for TIP Teachers' Attitude, Confidence and Proficiency in Computer Usage

Table E. 2

Varimax Factor Solution for 11 variables

Influence of TIP Training Program- Using Three Factors

	Section F of Survey: Changes in Use of Computers (Variables 21-31)	Factors and Factor Loadings		
		Use of Internet and Multimedia Software	Training on Use of Computer applications	Use of Word Processing and Integration With Content Areas
V26	Using clip art or drawings or graphics	**.78487**	.06424	.32702
V23	Desktop publishing- producing text documents with graphics	**.72338**	.10977	.31281
V27	PowerPoint or ClarisWorks Slide Show	**.65870**	.47952	-.14931
V25	Playing Audio CD on computer	**.61697**	.15986	.05790
V24	Software: Encarta, Canadian Encyclopedia	**.53930**	.13512	.51254
V21	Internet:	**.53476**	.02498	.25745
V30	Data Base	.07827	**.88280**	.10550
V29	Spreadsheet	.13590	**.87645**	.17175
V28	Transferring data between applications, e.g. between PowerPoint/ Graphics to word processing	.56047	**.56335**	-.12494
V22	Word processing	.09936	-.06576	**.85792**
V31	Integration of computer technology with the content area(s) I teach.	.24524	.24967	**.71529**

Table E. 3

Varimax Factor Solution for 18 variables

Requirement of Teachers for Implementation of Computers- Using Five Factors

		Factors and Factor Loadings				
	Section K of the Survey: Additional Opinions About Computer Usage **(Variables 55-72)**	**People Support Required by Teachers**	**Application Support Required by Teachers**	**Hardware & Technical Support Required by Teachers**	**Training Strategies Required by Teachers**	**School and Administrative Support Required by Teachers**
V68	In order for me to increase the use of computer technology with students, I require Being shown how to use computers	**.86079**	-.04506	.08639	.10171	.16869
V67	I require help in the form of hands-on training.	**.71534**	.33370	.17488	.31108	-.01533
V62	Assistance in the school from other teachers.	**.64769**	.43189	.21651	-.10082	.17865
V69	Continuous training in use of computers	**.62365**	-.04506	.32226	.48983	.05864
V65	Opportunities with colleagues as a team.	**.58622**	.55761	.04828	.05778	.03540
V72	Time to acquire computer skills and to learn about computer usage.	**.47928**	-.00529	.42495	.36892	-.05693
V61	Access to class sets of software.	.08801	**.74573**	-.00141	.18148	.15578
V60	I require More curriculum-specific software.	-.01921	**.66380**	.26828	.12165	.16708
V 66	Help in incorporating computers into curriculum.	.54337	**.61410**	.10010	.25776	-.03472
V 64	More teacher input into decisions about hardware and software purchases.	.43422	**.45133**	.02265	-.38383	.35472
V59	Someone in the school to help in the maintenance of the networking of computers.	.13078	.21142	**.78539**	-.02012	.03061
V55	Access to up-to-date computers for myself.	.23536	.08906	**.70582**	-.04845	.30284
V56	Require Access to up -to-date computers for my students.	.00856	-.04131	**.68614**	.30176	.27426
V 63	Access to timely technical and on-site help.	.24418	.54427	**.61255**	.07210	-.05383
V70	Training in the use of strategies for the reorganization of my class	.16134	.16913	.03447	**.83178**	.24847
V71	Training in the use of strategies, activities or approaches in teaching	.22306	.40053	.08996	**.77497**	.09025
V57	I require More administrative support.	.15035	.05872	.19184	.10874	**.85031**
V58	I require Easier scheduling of facilities.	.01039	.36837	.20303	.25192	**.63158**